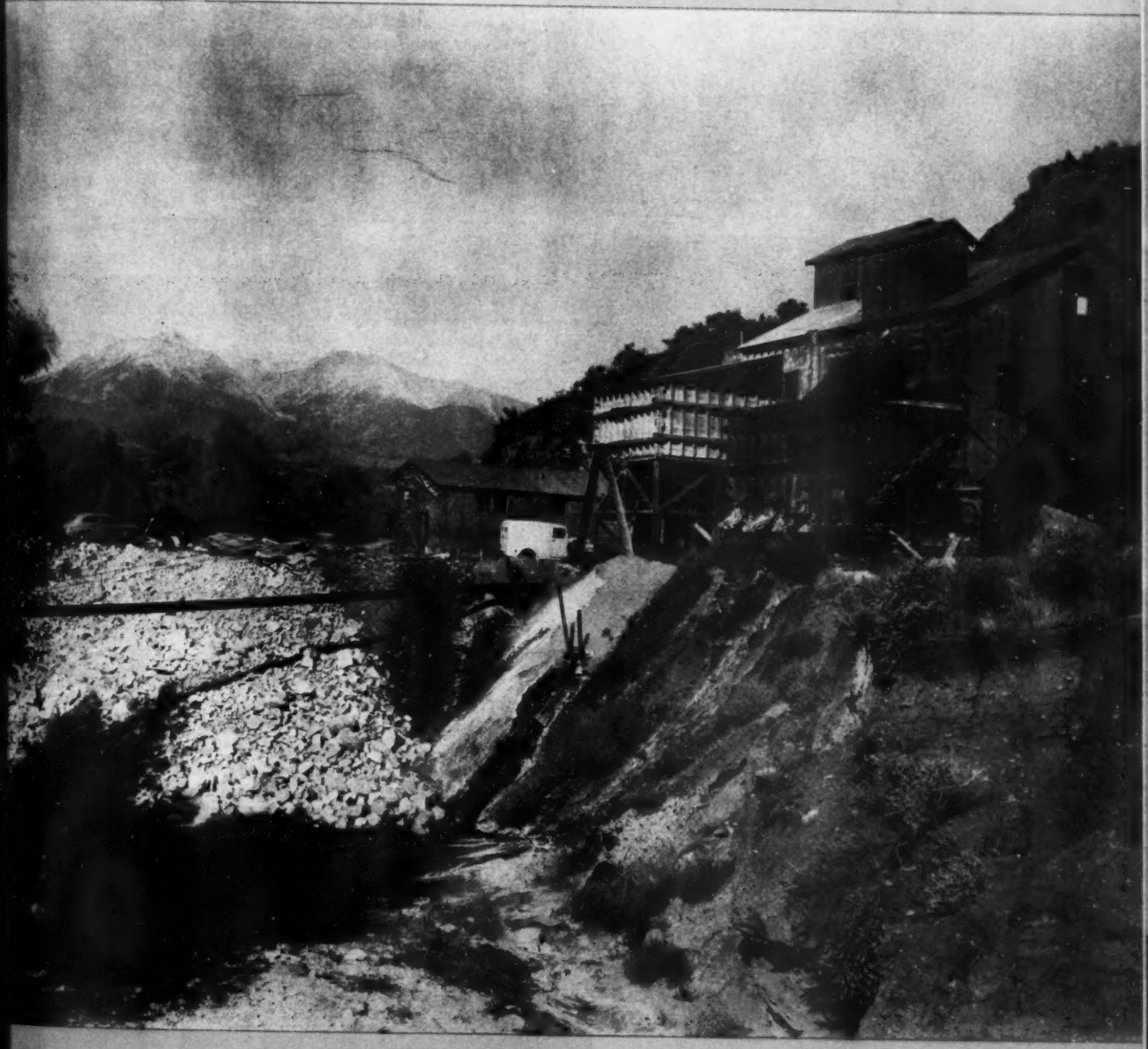
Mining CONGRESS JOURNAL

AMERICAN MINING CONGRESS

SEPTEMBER
1951

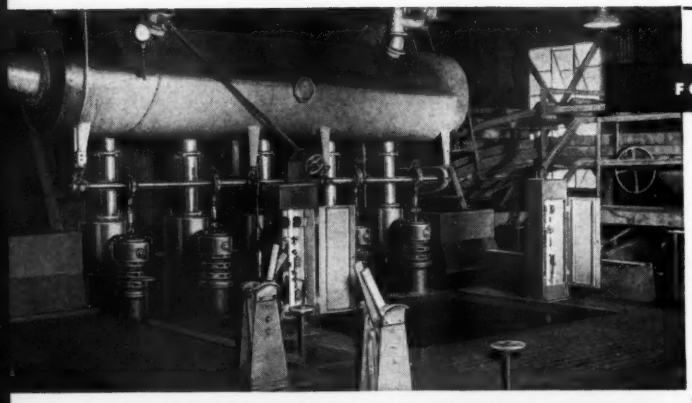


Get cleaner, more uniform coal ...at greater capacities!

Pick the right LINK-BELT coal washer to match your coal seam and your markets

LINK-BELT manufactures three coal cleaners . . . and all three remove foreign matter from coal with top efficiency, effectively separate slate, rock, bone.

Each cleaner is designed for a different set of requirements . . . the result of over 60 years of Link-Belt specialization in coal preparation. Our engineers will be glad to work with you and your consultants . . . help you get the washing equipment that best meets your needs.



FOR CONTROLLED, ECONOMICAL WASHING

Air-Pulsated Washer — Extremely flexible for high-capacity cleaning of sized and unsized coal. Compressed air allows graduated pulsations in different compartments—immediate removal of heavy refuse . . . sharp separation of lighter refuse and bone from coal. One-man operated and easily adjustable while running. Suitable for a wide range of coal characteristics and sizes.

FOR LARGE VOLUME AT LOW COST

Combined Trough Separator and Air-Pulsated Washer — By placing a Link-Belt Trough Separator ahead of the Air-Pulsated Washer, a large additional capacity can be cleaned with little added investment or operating expense. Trough floats off a large part of the coal so clean that it requires no further treatment. Remaining coal and middlings then go to air-pulsated jig.

FOR DIFFICULT WASHING JOBS

Float-Sink Concentrator — Latest advance in coal cleaning—utilizes Heavy-Media* separation process. Efficient for extremely high or low specific gravity separation . . . when a large percentage of coal is near the separating gravity . . . when amount of impurities in feed fluctuates or product must be quickly changed. Cleans larger sizes, reducing necessity for manual picking.

LINK-BELT

**The Heavy-Media Separation Processes are licensed by the American Zinc, Lead and Smelting Co. American Cyanamid Co., 30 Rockefeller Plaza, New York 20, N. Y., are their sole Technical and Sales Representatives for these processes.*

"How Can I Get Continuous, Flexible and Balanced Coal Mining at a Lower Dollar Cost?"

We, at Sanford-Day, find coal operators everywhere constantly trying to find the one sure answer to the above question. Many of them have accepted our solution to the problem and now agree that it is unquestionably the only successful system for realizing lowest cost coal production.

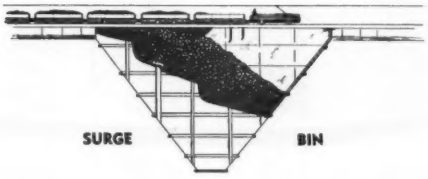
First and fundamental to the success of the system is an *Adequate Surge Bin.* Second is an adequate number of S-D "Automatic" Drop Bottom Cars. The Automatic Car is the only practical method of completely filling a surge bin. The only way a continuous flow of coal

from the face and continuous supply of coal to the preparation plant can be accomplished is through the use of a surge bin which will serve as a temporary storage for coal in transit. This temporary storage permits your mining operations and your preparation plant to function independently of each other. They are separate and distinct functions. For each to operate in the most economical manner, they must be carried on independently:

1—Any cleaning plant works best, and at the least cost, with an even continuous supply of coal. The surge bin continues to supply coal to the preparation plant when there is a breakdown or delay at the face.

2—Breakdowns or delays at the preparation plant need not stop mine production because the surge bin will take the coal until repairs are made.

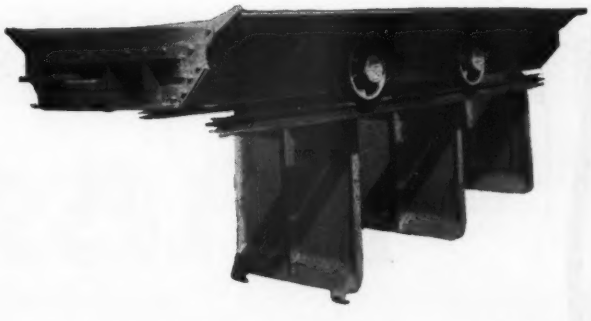
The Automatic coal mine haulage system was pioneered and developed by Sanford-Day Iron Works, a company of able engineers and mining men who have been originating and developing most of the improvements in design and construction of all type mine cars for over 50 years. In recent years this new system has become known through its wide use as the S-D "Automatic" System of coal haulage.



One who has not observed automatic coal mine haulage cannot visualize the continuity and smoothness of the operation. Cars are loaded and hauled by locomotives in the usual manner. As the trip of cars approaches the head house, they pass over an automatic scale where the coal is weighed in motion. The trip moves on to large surge bin where the cars automatically lay down their load of coal without breakage and without hesitation. This continues until the surge bin has been completely filled and the coal has been automatically leveled with the track from end to end. After dumping the car doors are automatically closed and the trip runs smoothly back into the mine for reloading.

Without question, the S-D "Automatic" System, comprising an adequate surge bin and any required number of S-D "Automatic" Bottom Dumping Cars, is the most economical method of main line haulage ever developed. Its leading advantage is that it not only cuts haulage cost to the minimum, it also permits mining operations at the face and at the preparation plant to function at the least possible cost because they operate independently of each other.

It may pay you in thousands of dollars of savings annually if you investigate this S-D "Automatic" System now! Write us today!



SANFORD-DAY IRON WORKS

KNOXVILLE TENNESSEE

JOY MACHINES

Field-Proved in Service

Made by the world's largest manufacturer of Underground Mining Equipment, and the pioneer in mechanized mining, JOY Equipment can give you the great advantage of

MORE PRODUCTION AT LESS COST

The JOY Line is COMPLETE

Note, in the comparison below, how JOY EQUIPMENT stands out in its ability to take care of Metal Mine Requirements

	JOY	Company B	Company C	Company D	Company E	Company F	Company G	Company H
ROCK DRILLS								
Spaders	YES	YES	YES	YES	YES	NO	YES	YES
Busters	YES	YES	YES	YES	YES	NO	YES	YES
Jack Hammers	YES	YES	YES	YES	YES	NO	YES	YES
Stopers	YES	YES	YES	YES	YES	NO	YES	YES
Drifters	YES	YES	YES	YES	YES	NO	YES	YES
Drill Jibs	YES	YES	YES	YES	NO	NO	NO	YES
Drill Jumbo (Track)	YES	YES	NO	NO	NO	NO	NO	YES
Drill Jumbo (Trackless)	YES	NO	NO	NO	NO	NO	NO	NO
DRILL BITS								
Carbide Bits	YES	YES	NO	NO	NO	NO	NO	NO
Detachable Bits	NO	YES	NO	NO	NO	NO	NO	NO
Thro-Way Bits	YES	NO	NO	NO	NO	NO	NO	NO
HOISTS								
Single Drum Utility	YES	YES	YES	YES	NO	NO	NO	NO
Single and Two Drum Shaft	YES	NO	NO	NO	NO	NO	NO	NO
Two Drum to 15 HP	YES	YES	YES	NO	NO	NO	NO	NO
Two Drum to 125 HP	YES	YES	NO	NO	NO	NO	NO	NO
Three Drum to 15 HP	YES	YES	YES	NO	NO	NO	NO	NO
Three Drum to 125 HP	YES	YES	NO	NO	NO	NO	NO	NO
Sheaves	YES	NO	NO	NO	NO	NO	NO	NO
CORE DRILLS								
Exploratory—Underground	YES	YES	NO	YES	NO	NO	NO	NO
Exploratory—Surface	YES	YES	NO	YES	NO	NO	NO	NO
Contract Core Drilling	YES	NO	NO	NO	NO	NO	NO	NO
ROTARY BLAST HOLE DRILLS								
Underground—Small Hole	YES	YES	NO	YES	NO	NO	NO	NO
Surface—Air Jet—Large Hole	YES	NO	NO	NO	NO	NO	NO	NO
COMPRESSORS								
Portable	YES	YES	YES	YES	YES	NO	NO	YES
Vertical—Air Cooled	YES	YES	YES	YES	YES	NO	NO	YES
Vertical—Water Cooled	YES	YES	YES	YES	YES	NO	NO	NO
Large Heavy Duty	YES	YES	YES	YES	YES	NO	NO	NO
LOADERS								
Scraper Slides	YES	YES	NO	NO	NO	NO	NO	NO
Mine Car Type	YES	NO	YES	NO	NO	YES	NO	NO
Trackless Loaders (Medium)	YES	NO	NO	NO	NO	YES	NO	NO
Trackless Loaders (Heavy)	YES	NO	NO	NO	NO	NO	NO	NO
MATERIAL HANDLING								
Shuttle Cars	YES	NO	NO	NO	NO	NO	NO	NO
Chain Conveyors	YES	NO	NO	NO	NO	NO	NO	NO
Shaker Conveyors	YES	NO	NO	NO	NO	NO	NO	NO
Belt Conveyors	YES	NO	NO	NO	NO	NO	NO	NO
MINE VENTILATION								
Portable Blowers, Electric	YES	NO	NO	NO	NO	NO	NO	NO
Portable Blowers, Air	YES	NO	NO	NO	NO	NO	NO	NO
Large Mine Fans	YES	NO	NO	NO	NO	NO	NO	NO

WRITE FOR BULLETINS, OR *Consult a Joy Engineer*

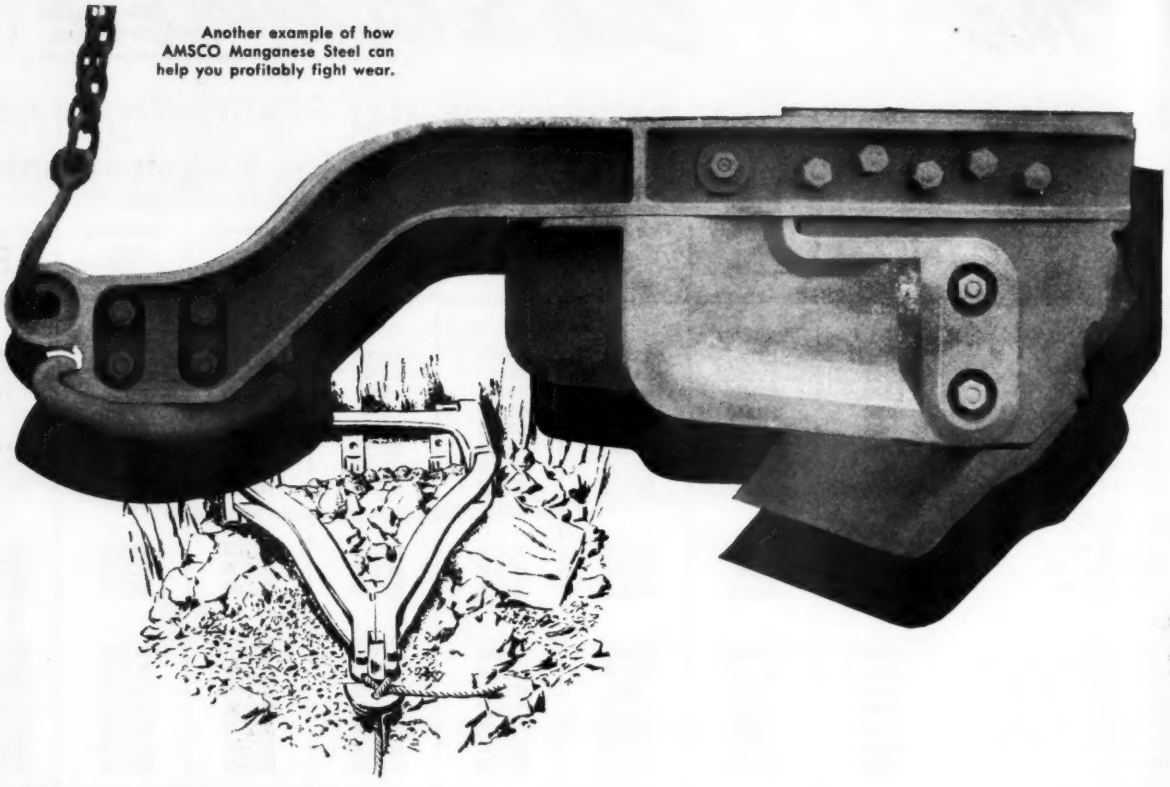
W&D M2372

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

Another example of how AMSCO Manganese Steel can help you profitably fight wear.



This SCRAPER cut maintenance costs 20%!

How AMSCO Manganese Steel proved tougher than a tough mining problem

One of the toughest mining operations you'll find anywhere—tough from the standpoint of how it punishes equipment—is scraping heavy, corrosive pyrite ore. For example, a California mine has a deposit of 98% pure pyrite—with a specific gravity of 4.8. Impacts and abrasion caused by this ore were making short work of the scrapers previously used . . . on the average they needed major repairs over 4 times per year.

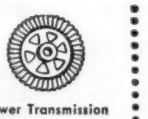
Several years ago two scrapers of the type shown above, which are sold exclusively by Joy Manufacturing Co., were put in service. They were made entirely of AMSCO Manganese Steel, and since then they've mined *over 220,000 tons of pyrite ore — and they're still in excellent condition!* These scrapers are repaired only once a year; simple repairs involving relipping and hardfacing of wearing surfaces.

Obviously, not all mining or excavating operations are as equipment-punishing as this one . . . *but the moral is clear . . .*

WHEREVER YOU MEET A PROBLEM OF WEAR CAUSED BY IMPACT AND/OR ABRASION . . .

. . . find out about longer-lasting, dollar-saving Manganese Steel made by AMSCO . . . world's largest producer of Manganese Steel castings for all industry.

AMSCO controls impact and abrasive wear in 5 basic industrial operations:

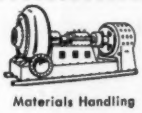


Power Transmission

Mining and Excavating

Transportation

Crushing and Pulverizing



Materials Handling

Brake Shoe

AMERICAN MANGANESE STEEL DIVISION

422 EAST 14th STREET • CHICAGO HEIGHTS, ILL.

Editorial Director
JULIAN D. CONOVER
Editor
JOHN C. FOX
Assistant to Editor
GEORGE W. SALL
Associate Editors
A. W. DICKINSON
G. B. SOUTHWARD
H. L. MOFFETT

Mining CONGRESS JOURNAL

Production
B. C. WILKERSON
J. J. WARD

Advertising
P. D. MCMURRER, Mgr.
FRANK W. MORAN
Chicago
RALPH F. DUYSTERS
New York City
RALPH W. HARKER
Los Angeles and San Francisco

Contents

VOLUME 37, NUMBER 9 FOR SEPTEMBER, 1951

FRONT COVER: Fluorspar for the national defense effort is shipped by the Colorado Fluorspar Corp. from this mill near Salida, Colo.

EDITORIAL: Mine Liquidation 29

MECHANICAL MINING IN ANTHRACITE 30
By W. I. STONEBRAKER AND ELMER E. YOUNG

MECHANIZATION AT FREDERICKTOWN 34
By SHERMAN A. WHITE AND J. A. ROOD

ECONOMY OF ROOF BOLTING 37
By GEORGE N. MCLELLAN

LIGHT WEIGHT DRILL COMBINATION USED IN CANADIAN MINES 40
By J. C. HEASLIP AND T. N. DAWSON

ELECTRIC POWER IN COAL MINING 50
By C. C. DARRAH, FRANK B. HUGUS AND JOHN A. DUNN

GEOCHEMISTRY—A Symposium on the Prospector's Newest Tool 55
By H. E. HAWKES, RAY E. GILBERT AND T. S. LOVERING

WITH THE DEFENSE AGENCIES 63
By HARRY L. MOFFETT

PLANS MATURE FOR WELL-ROUNDED MEETING IN LOS ANGELES 64

WHEELS OF GOVERNMENT 69

PERSONALS 71

NEWS and VIEWS 73

MANUFACTURERS' FORUM 86

Opinions expressed by authors within these pages are their own, and do not necessarily represent those of the American Mining Congress

Indexed regularly by Engineering Index, Inc.

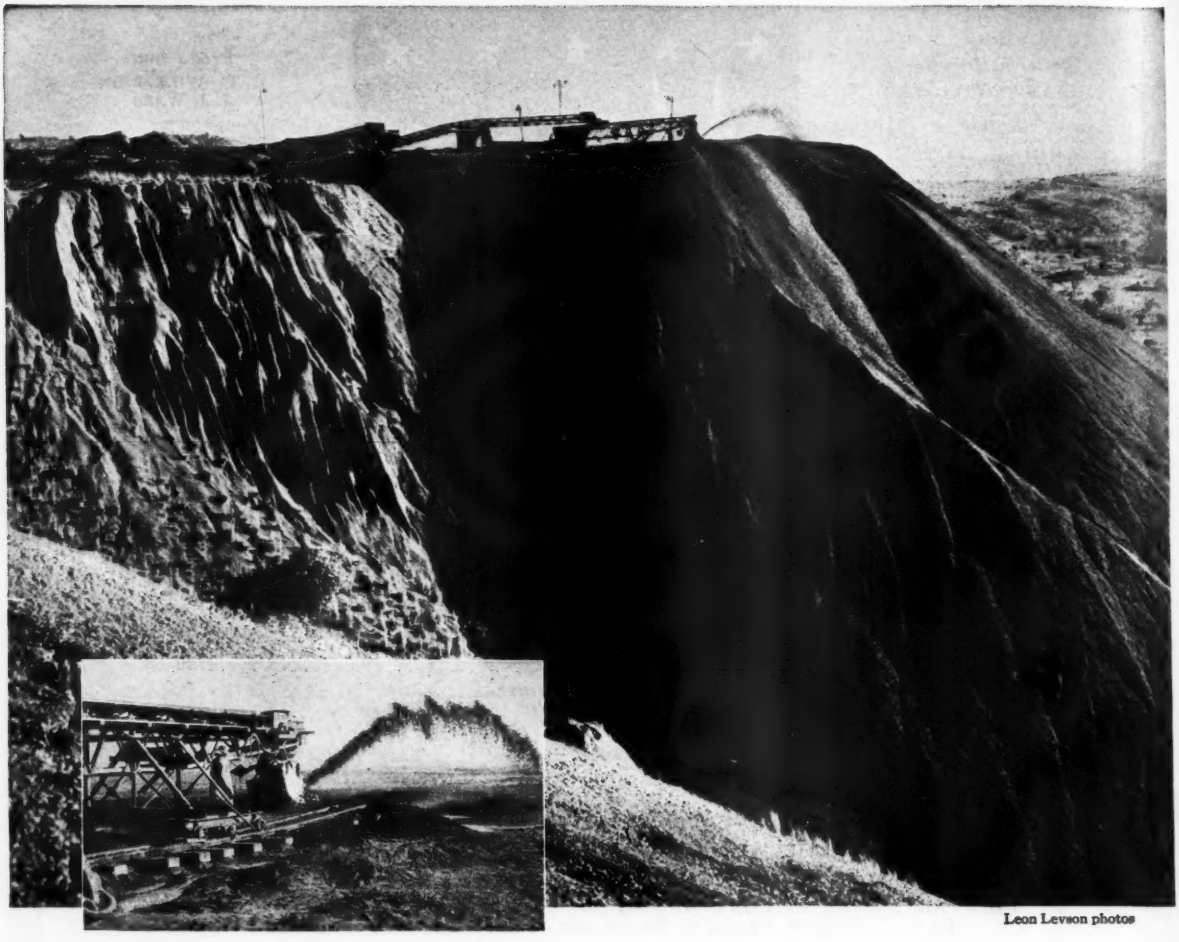
Copyright 1951, by

THE AMERICAN MINING CONGRESS
1102 RING BLDG., WASHINGTON 6, D. C.

HOWARD I. YOUNG, *President* — DONALD A. CALLAHAN, *Vice President* — ANDREW FLETCHER, *Vice President* — WILLIAM J. JENKINS, *Vice President* — JULIAN D. CONOVER, *Secretary*

Published Monthly. **Yearly subscriptions, United States, Canada, Central and South America, $3.00. Foreign, $5.00. Single copies, $0.30. February Annual Review Issue, $1.00. Entered as Second-class Matter, January 30, 1915, at the Post Office at Washington, D. C.**

Member Audit Bureau of Circulation.



Leon Levson photos

Mountain Under Construction

—700 tons an hour—at lowest cost per ton

To recover a single pound of diamonds about 15,000,000 lbs. of earth must be moved. Disposal of tailings is in itself a huge job—and cost-per-ton becomes a prime factor in profitable operations. This was the condition S-A engineers and Fraser & Chalmers (SA) Ltd., met in designing the conveying system that "built" the mountain you see above.

S-A equipment and 50 years of S-A engineering experience, have combined to produce a handling system that has fulfilled every expectation by moving enormous quantities of material at very low cost per ton. The flexibility of the system enables it to be extended easily and economically as needed.

If *you* have a bulk materials handling problem, let an S-A engineer show you what S-A can do to provide a *cost-reducing* solution. Write for a survey. No cost or obligation.

PREMIER DIAMOND MINE
Cullinan, Transvaal,
Union of South Africa

An S-A Centrifugal Thrower Unit mounted at the end of a Shuttle Belt Conveyor throws tailings out over the dump pit in a trajectory of 50 to 60 feet. The thrower can handle approximately 700 tons per hour and can be swiveled to aim in any direction. As the dump face builds up, the conveyor system is easily extended. (In addition to tailings disposal, all other handling operations in the entire recovery plant have been mechanized with S-A equipment.)

1901-1951

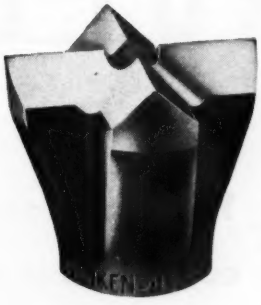
50 years experience with bulk handling

STEPHEN S-A ADAMSON MFG. CO.

52 Ridgeway Avenue, Aurora, Illinois · Los Angeles, Calif. · Belleville, Ontario

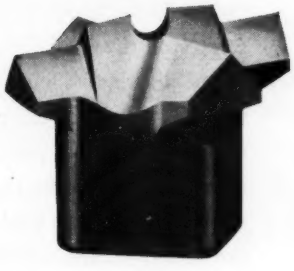
DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT

Only the Timken Company offers



ALL 3

ROCK BIT



TYPES

and a complete Rock Bit Engineering Service!

NO matter which type of removable rock bit is best for your particular job, you can get it from the Timken Company. For *only* the Timken Company *makes all three rock bit types*—multi-use, carbide insert, and one-use "Spiralock". And because our rock bit engineers have all three rock bit types to choose from, they can help you make an unbiased selection of the *one* best bit for your job.

From top to bottom above—

1. **MULTI-USE.** Gives lowest cost per foot of hole when full increments of drill steel can be drilled and when control and reconditioning of bits are correct.

2. **CARBIDE INSERT.** For drilling extremely hard and abrasive ground, small holes, extra deep holes. Holes go down faster, bit reconditioning is simplified.

3. **ONE-USE "SPIRALOCK".** For use where reconditioning is not feasible. Gives lowest unit cost. "Spiralock" union holds bit on dependably, permits easy removal.

Our rock bit engineers have all three rock bits to choose from and more than 18 years of field and laboratory experience behind them. So whether you're looking for lowest bit cost, lowest cost per foot drilled, high drilling speed, or any other advantage, call on them to get the bit performance you're after.

FREE BOOKLET! *Packed with helpful information. Shows full line of bits. Write The Timken Roller Bearing Company, Rock Bit Division, Canton 6, Ohio. Cable address: "TIMROSCO".*

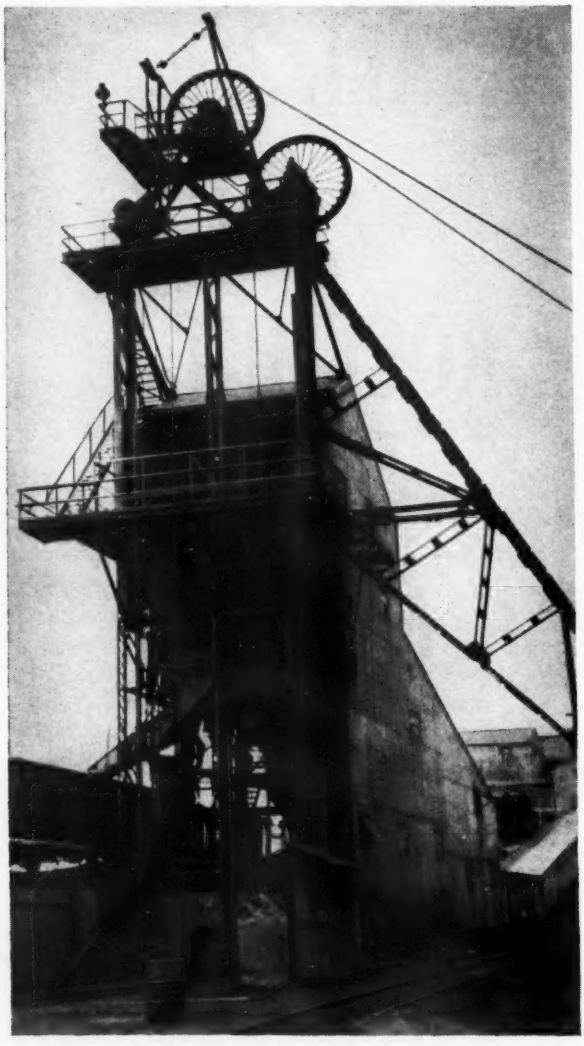
TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

your best bet for the best bit

. . . for every job

WIRE ROPE



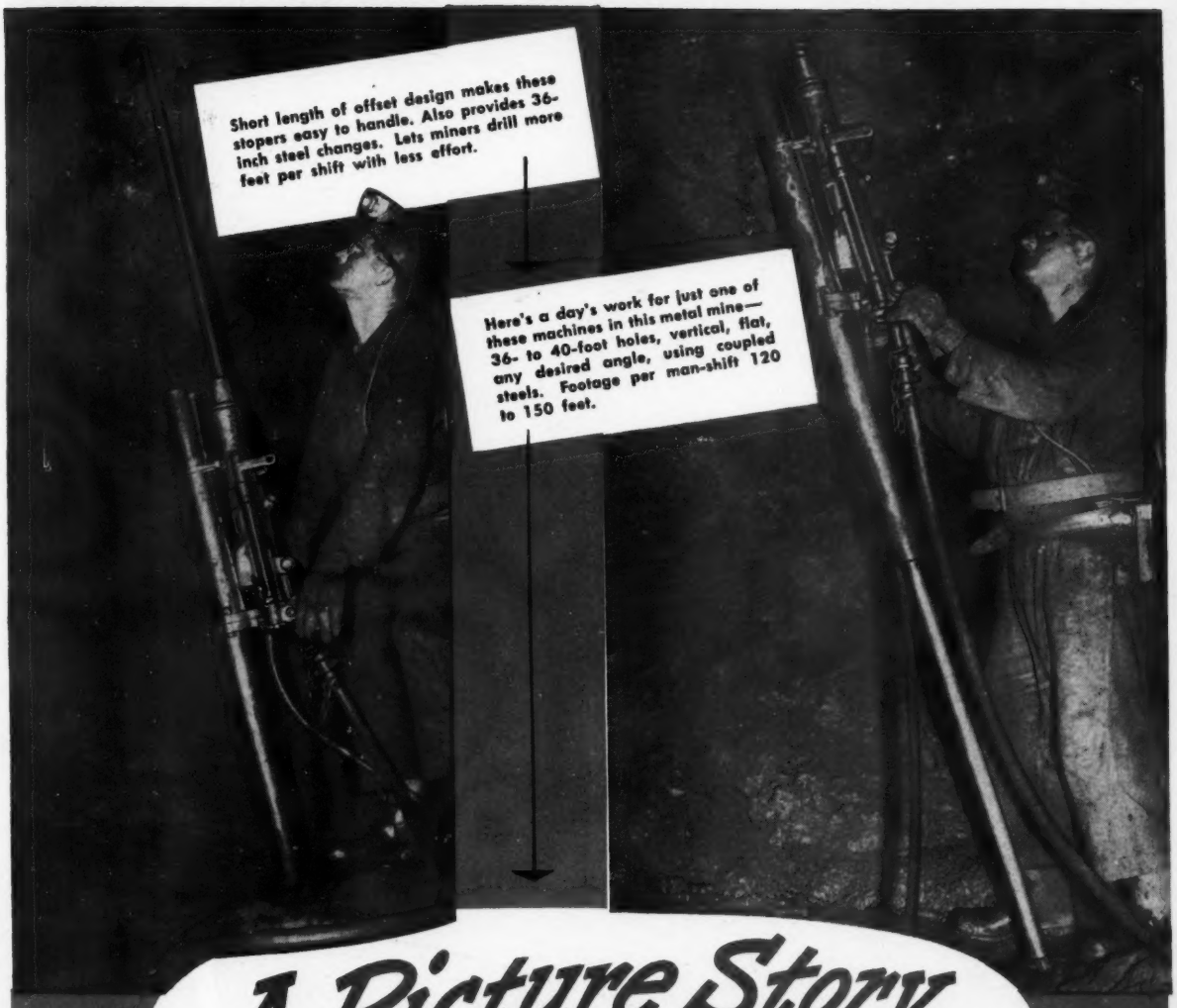
You'll get smoother, cost-saving service with Roebling

"BLUE CENTER" STEEL wire rope is an exclusive Roebling development. Its high resistance to abrasion, shock and fatigue spells long life. In addition, Roebling Preforming gives you a rope that is easy to handle... has better spooling qualities... reduces vibration and whipping. This combination makes Preformed "Blue Center" Steel Wire Rope a top performer on the job.

Roebling makes a complete line of wire rope... there's a construction for every installation. Have your Roebling Field Man help choose the *right* rope for your equipment. Get his advice on the correct use and maintenance of wire rope. It is based on performance records on thousands of installations. John A. Roebling's Sons Company, Trenton 2, New Jersey.

ROEBLING

Atlanta, 934 Avon Ave ★ ***Boston,*** 51 Sleeper St ★ ***Chicago,*** 5525 W. Roosevelt Rd ★ ***Cincinnati,*** 3253 Fredonia Ave ★ ***Cleveland,*** 701 St. Clair Ave, N.E. ★ ***Denver,*** 4801 Jackson St ★ ***Detroit,*** 915 Fisher Building ★ ***Houston,*** 6216 Navigation Blvd ★ ***Los Angeles,*** 216 S. Alameda St ★ ***New York,*** 19 Rector St ★ ***Odessa, Texas,*** 1920 E. 2nd St ★ ***Philadelphia,*** 230 Vine St ★ ***San Francisco,*** 1740 17th St ★ ***Seattle,*** 900 1st Ave, S. ★ ***Tulsa,*** 321 N. Cheyenne St ★ Export Sales Office, ***Trenton, N. J.***


Short length of offset design makes these stopers easy to handle. Also provides 36-inch steel changes. Lets miners drill more feet per shift with less effort.
Here's a day's work for just one of these machines in this metal mine—36- to 40-foot holes, vertical, flat, any desired angle, using coupled steels. Footage per man-shift 120 to 150 feet.

A Picture Story of Lower Stoping Costs

. . . shows how Le Roi-CLEVELAND offset stopers drill extra footage, save you money

Take a good look at these pictures. Note the length of the drill steel. Fitted with carbide-tipped bits, it gives you 36" of drilling—3 feet with every change.

That's one of the reasons why Le Roi-CLEVELAND offset stopers are paying off in lower drilling costs.

But it's not the whole story. The machines shown here are equipped with downstroke rotation. This gives plenty of power and lets the miners drill holes from 36 to 40 feet in depth — using coupled steel. Total footage drilled per man-shift runs from 120 to 150 feet.

Performance like this does a lot to keep costs down. It also accounts for the growing popularity of Le Roi-CLEVELAND offset stopers wherever stoping is a problem.

Other features of these machines are: Removable water tube — no need to dismantle the machine. Graduated feeding pressure. Constant blowing at chuck keeps machine clean. Write us today for complete details.

LE ROI

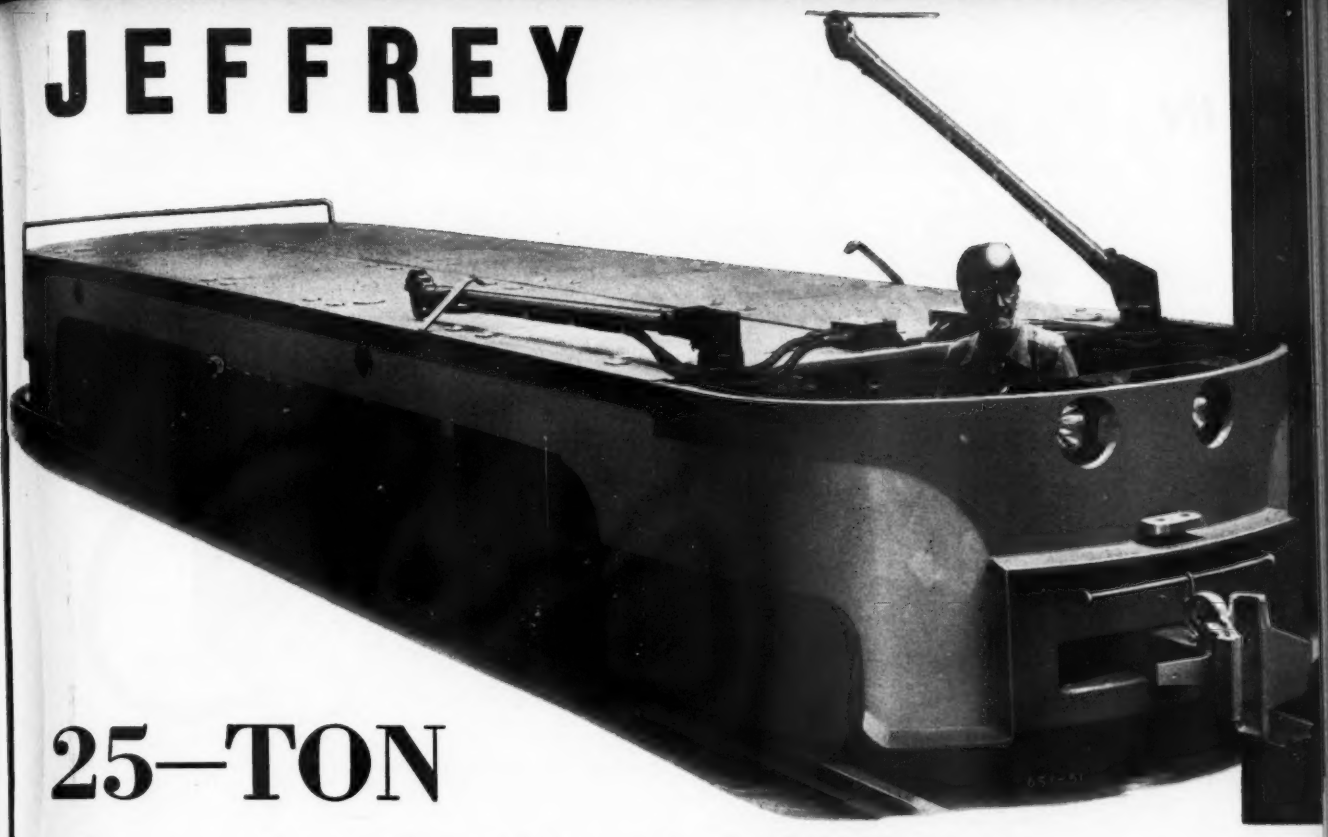
LE ROI COMPANY

RD-33

CLEVELAND ROCK DRILL DIVISION
12500 Berea Road, Cleveland 11, Ohio
Plants: Milwaukee, Cleveland and Greenwich, Ohio

power plus!

JEFFREY



25–TON

(8-wheel) MAIN LINE LOCOMOTIVES

WITH THESE FEATURES:

- All-welded Frame
- Will Negotiate a 50-foot Radius Curve
- Four 80 H. P. Ventilated Motors (8 miles per hour)
  For 12 m.p.h. operation—120 H. P. motors available
- Full Electro-pneumatic Contactor Control with Dynamic Braking
- Straight Air Brakes
- Air Sanders for both directions on each truck
- Storage Battery operated Controls and Headlights
- Auxiliary Air Tank for operation of pneumatic contactors for emergency dynamic braking in case of power failure

The Jeffrey Manufacturing Company

958 North Fourth Street, Columbus 16, Ohio

District Offices

Baltimore 2	Buffalo 2	Denver 2	Houston 2	Philadelphia 3
Beckley, W. Va.	Chicago 1	Detroit 13	Jacksonville 2	Pittsburgh 22
Birmingham 3	Cincinnati 2	Forty Fort, Pa.	Milwaukee 2	Salt Lake City 1
Boston 16	Cleveland 15	Harlan, Ky.	New York 7	St. Louis 1

Jeffrey builds a complete line of Trolley and Storage Battery Locomotives for gathering or haulage. Send for details.

Service Stations

Birmingham—Pittsburgh—Johnstown—Forty Fort, Pa.—Mt. Vernon, Ill.—Harlan, Ky.
In West Virginia: Beckley—Cabin Creek—Logan—Morgantown—Welch

Associated Companies

Jeffrey Mfg. Co., Ltd., Montreal, Canada
British Jeffrey-Diamond Ltd., Wakefield, England
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S. A.
The Ohio Malleable Iron Co., Columbus, Ohio
The Galion Iron Works & Mfg. Co., Galion and Bucyrus, Ohio
The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio
Galion (Great Britain) Ltd., Wakefield, England

IN

Kentucky, Illinois and Indiana

the trend is to

WHEAT-EQUIPPED MINES

Eastern Kentucky

Adventure Coal Company
Asbury Coal Company
Beaver Coal & Mining Company
Borderland Collieries Company
Blue Diamond Coal Company
Buchanan Coal Company
Bartley, Blevins & Clark Coal Company
Cinderella Coal Company
Citation Coal Company
Clear Branch Mining Company—2
D. J. B. Collieries, Inc.
Diamond Elkhorn Coal Company
Elkfoot Mining Corporation
Elkhorn & Jellico Coal Company
Feds Creek Coal Company
Garrard Coal Company
Harold Fuels, Inc.
Inland Steel Company—3
Jewell Coal Corporation
Kenmont Coal Company
Kentland-Elkhorn Coal Co.
Lick Fork Coal Company
Mary Gail Coal Company
Morgan Coal Company
New Big Creek Mining Company
New Hyden Coal Company
Pond Creek Pocahontas Company
Pound Mill Coal Company
Pruden Coal & Coke Company—3
Stoker Coal Company
Southern Kentucky Coal Company
Semet Solvay Division, Allied Chemical & Dye Corporation
Sammons Construction Company
Turner Elkhorn Coal Company—2

Western Kentucky

Bassett Coal Company
Caney Creek Mining Company
Crescent Coal Company—2
C. & P. Coal Company
Charleston Sixth Vein Collieries
Dawson Collieries, Inc.
Dawson Daylight Coal Company
Franklin & Sons Coal Company
Lavada Coal Company
Miners Coal Company—2
Magnolia Mining Company
Roberts Bros. Coal Company
Syers Coal Company
Walker & Sons Coal Company
West Kentucky Coal Company

Illinois

Bell & Zoller Coal & Mining Co.—2
Blaine Coal Company
Crab Orchard Coal Company
Freeman Coal Mining Co.—2
Golden Rule Coal Company
Little Dog Coal Company
Mid-Continent Coal Company
Peabody Coal Company
Virden Mining Company
H. B. Wilson Coal Company

Indiana

Buck Creek Coal Company
Ingle Coal Corporation
Princeton Mining Company
Rosehill Coal Company
South Linton Coal Company
Sunshine Coal Company
Viking Coal Company

NOTE: The figure after the company name indicates the number of mines using Wheat Lamps.

National Mine Service Company

Has the Facilities—Delivers the Goods

BEMECO DIVISION
Beckley, W. Va.

ALL-STATE DIVISION
Logan, W. Va.

WHITEMAN DIVISION
Indiana and Altoona, Pa.

KY.-VA. DIVISION
Jenkins, Ky.

ANTHRACITE DIVISION
Forty Fort, Pa.

WESTERN KY. DIVISION
Madisonville, Ky.

it's as quick and easy as it looks

← TO CARRY

← TO SET UP

TO DRILL ↓

that's why the JL-4 JACKLEG can increase your footage up to 50% or more

Take the JL-4 Jackleg into the smallest tunnel or tightest corner—set it up in an instant—collar the hole—and let the JL-4 do *all the work.* It supports the Jackhamer, absorbs the recoil, and feeds the drill uniformly into the rock.

Elimination of set-up time and faster drilling speed with smaller Carset Jackbits can increase footage as much as 50% in scram drifts, coyote holes, slashing in stopes, square set mining and sublevel work.

The new JL-4 embodies many new features for easier, more efficient operation. Feed legs up to 4′ long plus extension pieces permit the use of longer steels—an improved pressure valve gives better control of feed rates—a finger-tip bleed-off valve gives instant pressure release—renewable clamping plates and a bayonet connection simplifies mounting the drill on the leg. The JL-4 is the result of 12 years experience in manufacturing and applying Jacklegs, in worldwide installations.

For complete information, see your nearest I-R representative. He is a skilled specialist in the application and servicing of every type of rock drilling equipment. He is backed by factory branch stocks and service in your vicinity.

This Complete I-R Combination has **NO EQUAL** for fast, efficient small-hole drilling

JL-4 JACKLEG with **J-40 JACKHAMER** and SERIES 113 **CARSET JACKBITS**

Comparative Tests—both in the factory and on the job—have proved that this I-R Jackleg Combination out-performs other equipment of its type in drilling speed. Air consumption and maintenance costs are exceptionally low.

Ingersoll-Rand

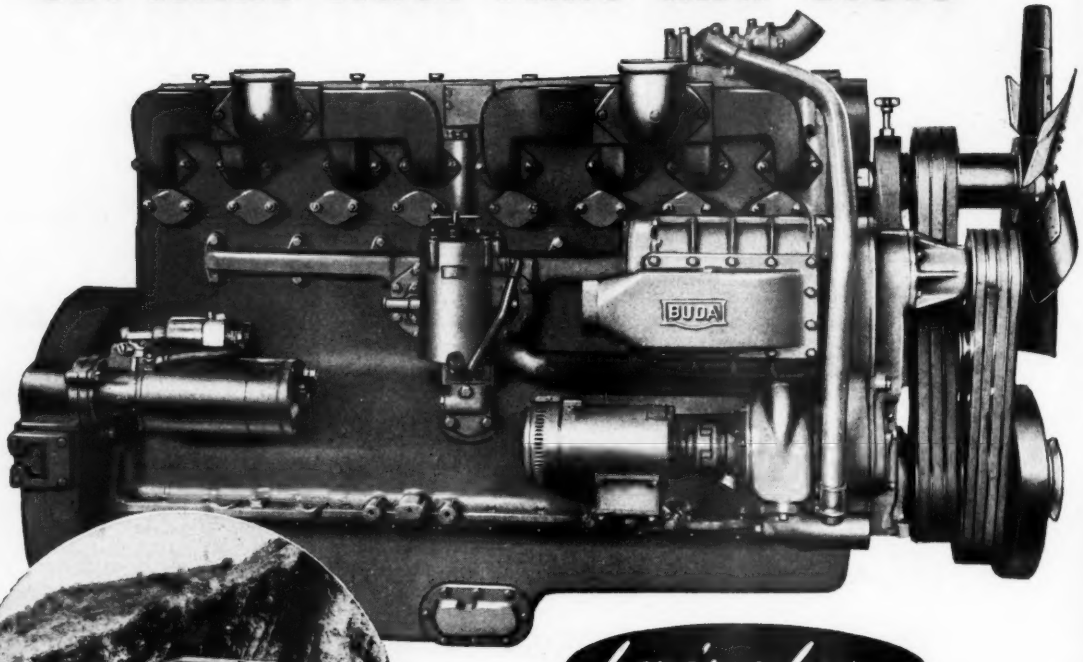
11 BROADWAY, NEW YORK 4, N. Y. 674-5

CARSET JACKBIT SET WITH CARBOLOY INSERTS

ROCK DRILLS • COMPRESSORS • AIR TOOLS • CENTRIFUGAL PUMPS • TURBO BLOWERS • CONDENSERS • DIESELS • GAS ENGINES

Big 350 h.p. BUDA Super Diesels

Cut Mine Haul Time and Costs



Buda 1125 Dyna-Swirl Diesel powers this Model 140 Dart Truck at Bagdad Copper Corp.

Model 140 DART powered by Buda 1125 Super Diesel hauls 22 ton payloads up 12% to 18% grades with 5 switchback turns at 4 MPH in 4th gear.

here's why....

BUDA Dyna-Swirl DIESELS give:

- ★ 10 to 17% higher usable torque (lugging ability).
- ★ 12 to 18% more horsepower at normal operating speeds.
- ★ 6,000 or more operating hours between major overhauls.
- ★ Less operator fatigue—smoother operating—less noise—less smoke—less vibration.
- ★ Controlled governor action and progressive starting definitely easier on clutches, transmissions, final drives and tires.

Give old Units new life—repower with BUDA. There are no finer precision-made Diesel engines than BUDAS! Ask your Buda Distributor for the facts today on the BIG new "DA" Diesels. Write for free colorful bulletin and specifications. ***The Buda Company, Harvey, Ill.***

BUDA

a Power-Full and Dependable Name in Engines

BUDA COAST TO COAST FACTORY EXPERIENCED SERVICE AND PARTS

BC-11

you can't beat progress...

These two 4-yd. electric shovels have played a big part in the successful change to open pit mining at Inspiration Consolidated Copper Mines at Inspiration, Arizona. A third P&H will provide increased production to meet the growing need for copper.

ELECTRIC P&H SHOVELS

All the advancements in electrical digging made by P&H have one common purpose — *lower tonnage costs.*

Here's *faster operation* with such P&H improvements as Magnetorque* Hoist Drive, stepless power regulation . . . independent propel for faster move-ups.

Here's *steadier digging* — many of the old mechanical devices which caused trouble and delay are eliminated — no slip friction clutches; no sliding gears to shift, no electrical contactors in main control system.

Here's *lower maintenance cost* — all-welded construction originated by P&H — induction-hardened gearing — filtered air cab.

When you put these, and other progressive P&H ideas to work, you're sure of lower tonnage costs in all kinds of open-pit operations.

P&H leads the field in electric shovel developments.

*T. M. of Harnischfeger Corporation for electro-magnetic type clutch.

P&H **ELECTRIC SHOVELS**
4555 W. National Avenue
Milwaukee 14, Wisconsin
HARNISCHFEGER CORPORATION

Every third P&H Electric Shovel sold is a repeat order

Exide-Ironclad
BATTERIES

ARE YOUR BEST POWER BUY— AT ANY PRICE

They PROVIDE ample power for fast, high-production haulage — more trips per shift, dependable round-the-clock performance, with no end-of-shift slowdown, no unscheduled down time . . . ASSURE inherent safety, with freedom from hazards of fire, fumes, noise . . . SHOW low costs of operation, maintenance, repair, depreciation. SIZES for all makes of battery-powered mine locomotives, trammers, shuttle cars. Call in an Exide representative, and let him prove these facts.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2

Exide Batteries of Canada, Limited, Toronto

"Exide-Ironclad" *Reg. Trade-mark U. S. Pat. Off.*

For Modern MINES

Thor SINKER LEGS

SENSATION OF THE MINING INDUSTRY

Compact air feed leg clamps to standard Sinker Rock Drill, converts upward lifting action to positive forward feeding pressure. Drills holes at any angle!

Thor PORTABLE POWER TOOLS

FOOL-PROOF CONTROLS—Roll-type feed throttle and air bleeder valve button, located side by side, give drill runner complete control of operation at all times.

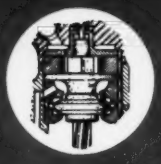
EXCLUSIVE "AROUND THE CYLINDER" CLAMPING. Bayonet connection permits drill and cradle to be removed as unit for use as Sinker or for instantaneous replacement by larger or smaller drills.

PISTON ROD STATIONARY. Model 53, 36" nominal feed travel, weight 38 lbs.

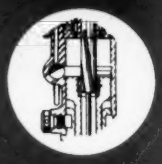
CYLINDER STATIONARY. Model 63, 48" nominal feed travel, weight 50 lbs. Model 64, 38" feed travel, weight 44 lbs.

and Mining Applications

INDEPENDENT PNEUMATIC TOOL COMPANY • AURORA, ILLINOIS



EXCLUSIVE AUTOMATIC VALVE utilizes ALL the air that enters the machine, measures it for most effective use through machined tolerances of .00025 of an inch. No separate valve parts to lose or wear!



"STRAIGHT LINE" BLOWING — Blower Valve puts compressed air at full line pressure directly through the tool to the drilling face. Heavy blast blows the hole clean, prevents "stuck steels."

Thor

SINKER ROCK DRILLS

30 lb.
No. 28

Ideal for light to medium drilling and block holing up to 6 feet deep. For coal mining, can be equipped with side exhaust and rotation on the power stroke for augering. Spring wire retainer optional.

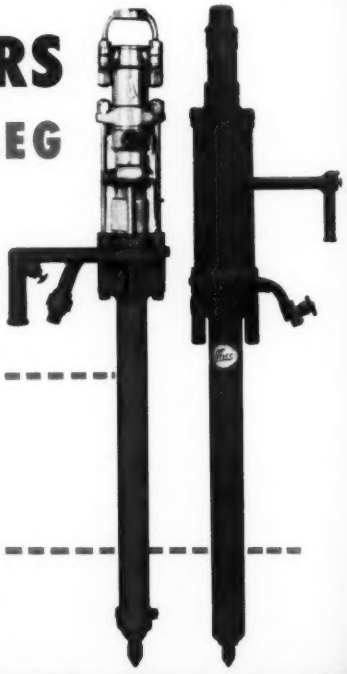
35 lb.
Nos. 33 and 35

These drills are designed for secondary drilling up to 8 feet deep; light weight for drilling horizontal and upward holes. No. 35 is equipped for full line pressure blowing.

45 lb.
No. 38

An all-purpose medium weight Sinker for holes up to 12 feet deep. Mounted on Sinker Leg can be used for Drifting, especially with carbide bits. With Thor Stoper Leg, the No. 38 can be adapted to stoping.

Thor **STOPERS and STOPER LEG**

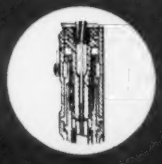


STOPER LEG

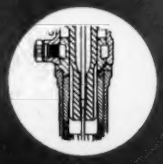
Supports and feeds Sinker Rock Drills for overhead drilling. Can be used with Thor No. 38 or 48 Rock Drills, simply by removing two bolts and backhead. Order No. 51 Stoper Leg. Weight 46 lbs. 18" steel change.

STANDARD AND REVERSE FEED STOPERS

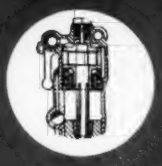
Three sizes, six models with standard or reverse feed to handle all stoping and other overhead drilling operations. Reverse feed permits machines to be used in horizontal positions on pneumatic columns. (See photo, left).



ENDLESS PISTON LIFE — Years of practical field experience show piston breakage practically eliminated in Thor Rock Drills, amazing life for contacting surfaces.



AUTOMATIC LUBRICATION — Built-in lubricator forces oil under pressure through all moving parts with every reciprocation of the piston hammer.



RIFLE BAR ASSEMBLIES available in standard, slow, fast and special rotation speeds to provide for efficient drilling in various types of rock formation.

AUGER ROCK DRILLS

55 lb.
Nos. 72 and 75

For drilling holes up to 20 feet deep in hardest rock. Recommended for shaft sinking. Can be used with Thor Sinker Leg or Air Bar Feed for economical carbide bit drifting. No. 75 uses collared steel, No. 72 for steels with round lugged shank or tappet construction for plain shank hexagon steels.

80 lb.
No. 85B

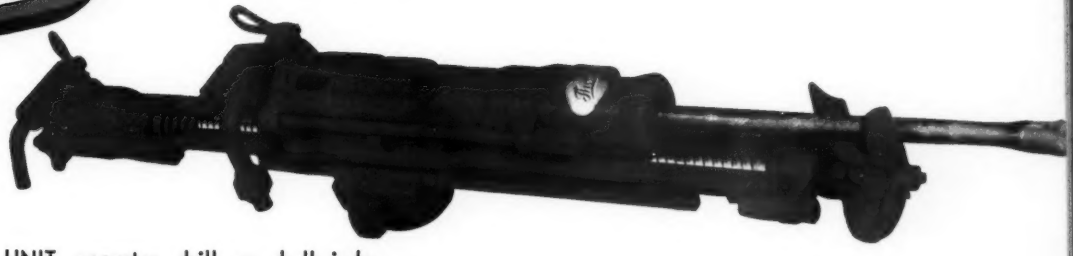
A husky, powerful Sinker for heaviest duty service in hardest rock, where conditions calls for a hand held drill to sink holes up to 25 feet deep. Recommended for heavy duty shaft sinking.

35 lb. **No. 139**

45 lb. **No. 48**

Equipped with augering rotation on the power stroke. Recommended for all iron, bauxite and anthracite mines, and for tunneling through shale and slate, cemented gravel, talc, clay and other loose or broken formations. (See also 30 lb. No. 28 Drill).

Thor POWER-FEED DRIFTERS



POWER UNIT operates drill on shell independently of Drifter—no vibration during rapid advance or return . . . no recoil, positive spring cushion stop, better balance — for LONGER TOOL LIFE.

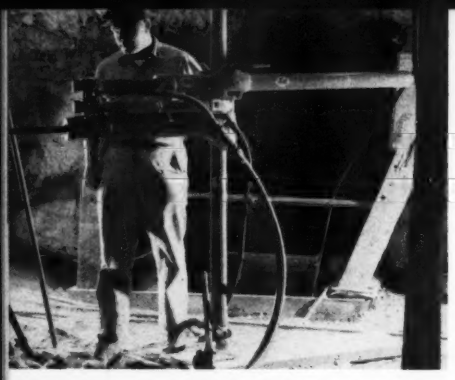
- Perfect power for carbide bit drilling.
- Perfect control at ALL drilling speeds.
- 25% more efficient by actual mine tests!

New development provides full power at slowest speeds: drill starts moving immediately upon opening of motor throttle . . . from fast drilling down to a 2-inch per minute crawl. Ideal for carbide bit drilling . . . and for jumbo mounting.

THREE SIZES: RF-48, 24" + 24" feed; RF-60, 30" + 30" feed; RF-96 (aluminum), 48" + 48" feed.

REPLACEABLE CHUCK — Quick, easy, economical chuck replacement protects against excessive steel breakage or damage to the piston hammers.

RUBBER CUSHIONED RETAINER absorbs shock while drill steel is being removed from hole. Fully enclosed, dirt proof operating parts assure low maintenance.



PNEUMATIC COLUMNS. Exclusive four-foot travel eliminates timbering. Safety throttle and spring-actuated check-valve prevent accidental collapse of column. Two-prong foot standard; four-prong foot available for extra stability when using arms. Accommodate air bar feeds, reverse feed stopers, hand or power feed drifters. Three sizes: TC-6 (6 to 10 ft.); TC-8 (8 to 12 ft.); TC-10 (10 to 14 ft.)

Thor AIR BAR FEEDS

For mounting on Thor Pneumatic Columns (see photo,left), or on 3" or 3½" screw jack column and arm, cross bar or jumbo set up.

Converts hand-crank Drifters — and Sinkers — to power feed, forward and reverse. Feeds from any position, in any direction. Four models available for drifting, stoping and sinking with Thor Nos. 82 and 92 Drifters, No. 75 Sinker. 32" nominal feed.

CLAMPS. Complete line, for pneumatic or screw-jack columns.

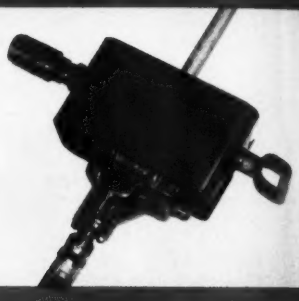
AIR BAR FEED supports and feeds Drifters and Sinkers.

ROOF BOLTING TOOLS

STOPERS BOLT DRIVERS

IMPACT WRENCHES

WAGON DRILLS



COAL DRILLS

SAWS

Thor SUMP PUMPS

Self-priming . . . operate efficiently in dirty water, oil . . . partially or fully submerged. Exclusive large capacity lubricating system lubricates all moving parts up to a full shift. Two sizes.

361T. A medium size pump most effective up to a 60 foot head (114 gal. per min. at 60 ft. head, 90 lbs. pressure). Can be furnished to operate in tandem, pumping up to a total head of 160 feet at 90 lbs. pressure.

381T. For continuous heavy duty pumping to high levels (50 gals. per min. at 160 ft. head, 90 lbs. pressure).

COMPLETE LINE OF PNEUMATIC AND ELECTRIC HAND TOOLS

SAWS

IMPACT WRENCHES

DRILLS AND WOOD BORERS

GRINDERS

HAMMERS

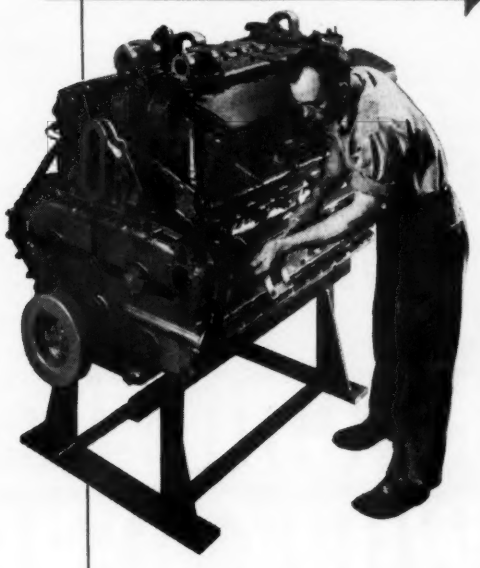
Printed in U.S.A.

J.E. 13

INDEPENDENT PNEUMATIC TOOL COMPANY • AURORA, IL

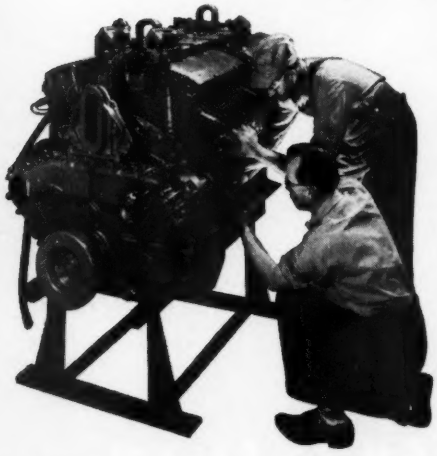
BIRMINGHAM BOSTON BUFFALO CHICAGO CINCINNATI CLEVELAND DENVER DETROIT HOUS
LOS ANGELES MILWAUKEE NEW YORK PHILADELPHIA PITTSBURGH ST. LOUIS ST. PA
SALT LAKE CITY SAN FRANCISCO SEATTLE LONDON, ENGLAND SÃO PAULO, BRAZIL TORONTO

BUILT NOT ONCE BUT TWICE!



Cummins is the custom-builder of the Diesel industry. Each engine is built to *fit the job*—and the individual piece of equipment in which it is to be installed. And *every* Cummins engine is built *twice*. First, each engine is assembled, run-in tested. Then it is disassembled completely, and inspected. Finally it is reassembled and tested *again*. This extra care in precision building, Cummins exclusive fuel system, efficient parts and service organization . . . mean *less* "down-time" and *more* power and profits for Cummins users. *See your Cummins dealer.*

Cummins® CUSTOM BUILT Diesels



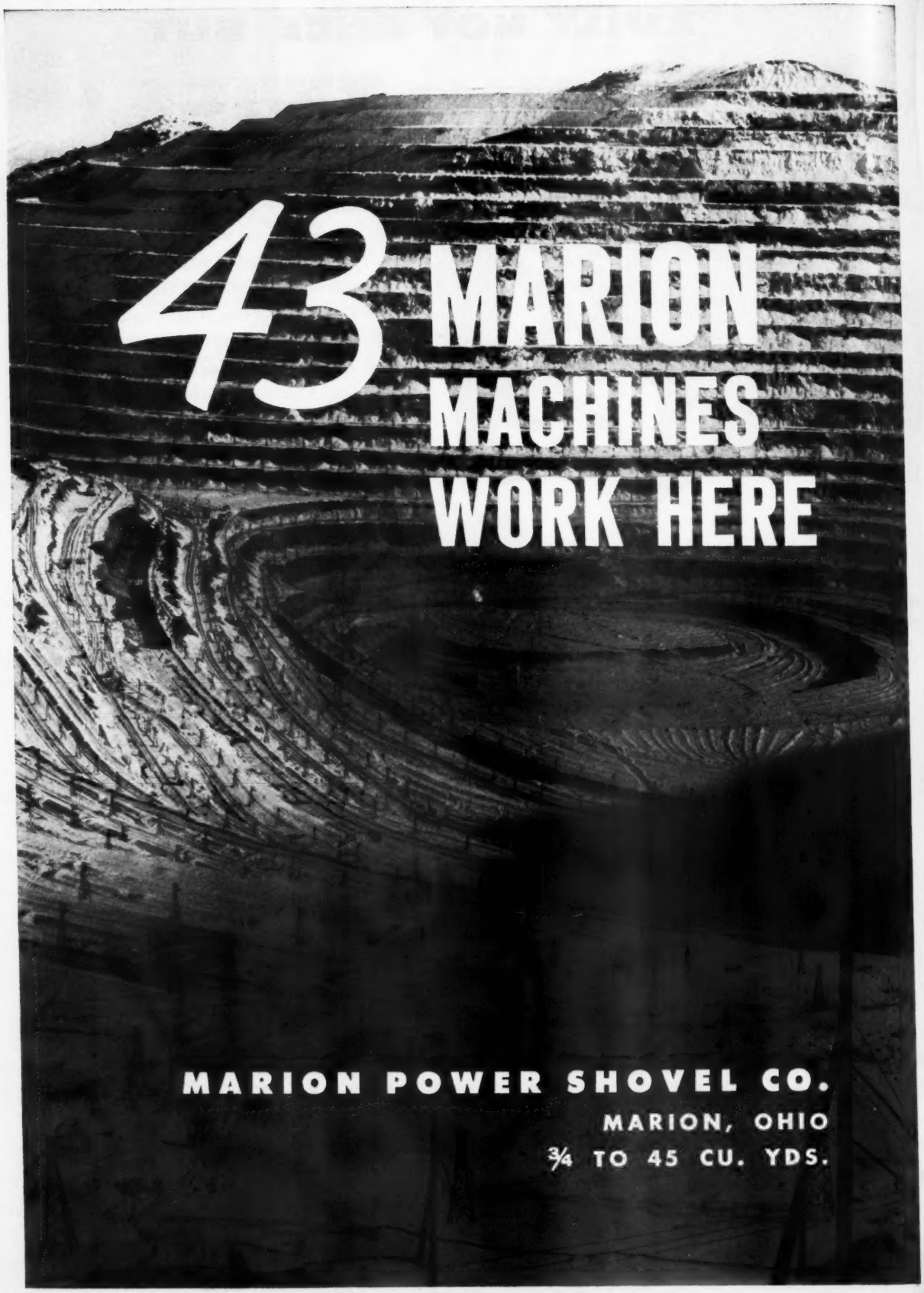
Lightweight High-speed Diesel Engines (50-550 hp)
for: on-highway trucks
off-highway trucks • buses
tractors • earthmovers
shovels • cranes
industrial locomotives
air compressors
logging yarders and loaders
drilling rigs
centrifugal pumps
generator sets and power units
work boats and pleasure craft

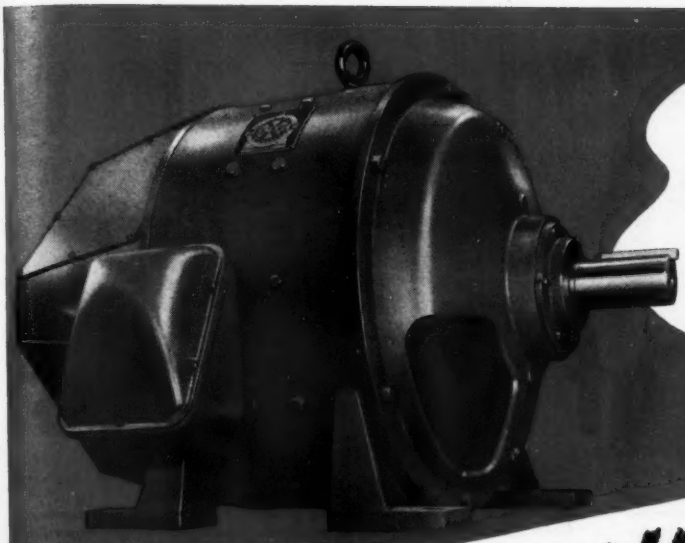
CUMMINS ENGINE COMPANY, INC., COLUMBUS, INDIANA
Export: CUMMINS DIESEL EXPORT CORPORATION • Columbus, Indiana, U. S. A. • Cable: CUMDIEX

Diesel power by CUMMINS

CUMMINS Diesel

TRADEMARK REG. U. S. PAT. OFF.


43 MARION MACHINES WORK HERE
MARION POWER SHOVEL CO.
MARION, OHIO
¾ TO 45 CU. YDS.



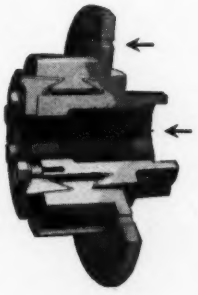
RELIANCE
TYPE 'T' HEAVY DUTY
D-C. MOTORS

THE TOUGHEST MOTORS EVER BUILT...

because since the building of the first Type 'T' D-c. Motor nearly 50 years ago, users have contributed from their experience to help Reliance engineers increase the stamina of the Type 'T' design to meet the most grueling service conditions encountered in industrial applications.

Completely assembled Type 'T' armature, Reli-X insulated and dynamically balanced.

Heavy duty armatures, for example, feature cores of high-grade silicon steel punchings and shafts which have been finish-ground to assure accurate fits. All armatures are Reli-X insulated and dynamically balanced. High-riser type commutators are designed and built to meet overspeed requirements. Further facts about the heavy duty construction of armatures and other vital parts of Reliance Type 'T' D-c. Motors are detailed in Bulletin C-2001. Write for this handy reference which also gives mechanical designs, dimensions and selection data on Type 'T' Motors from 3/4 to 1000 horsepower for constant and adjustable-speed operation.



Cross-sectional view of armature with high risers and sturdy spiders indicated.

RELIANCE ELECTRIC AND ENGINEERING CO.

1116 Ivanhoe Road, Cleveland 10, Ohio • Sales Representatives in Principal Cities

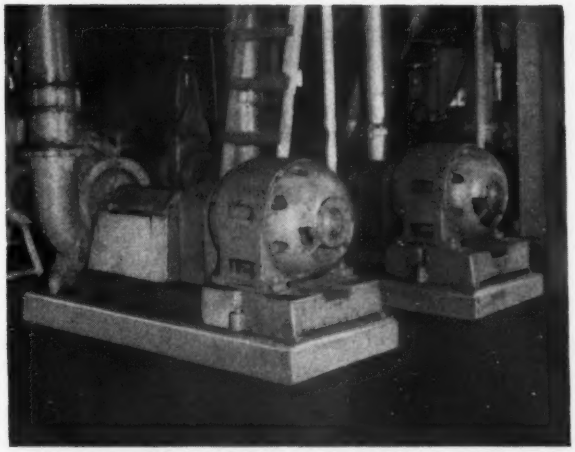
New river-loading plant cleans 800 tph of coal with help of G-E drives!

At the rate of 800 tons per hour, Truax-Traer's central Ceredo plant prepares high-grade metallurgical and steam coal from the company's mines as far as 80 miles away. Completed in January 1950, it utilizes a unique barge-loading plant with retractable belt conveyor (shown at left) which permits automatic loading of barges regardless of wide fluctuations in river level.

GENERAL ELECTRIC

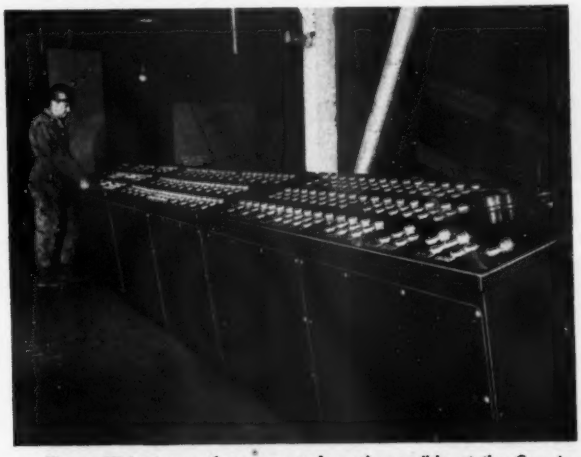
GEA-18

Truax-Traer Coal Company's Ceredo, W. Va., preparation plant—loading automatically to both river and rail—relies on General Electric motors and control for stay-on-the-job dependability

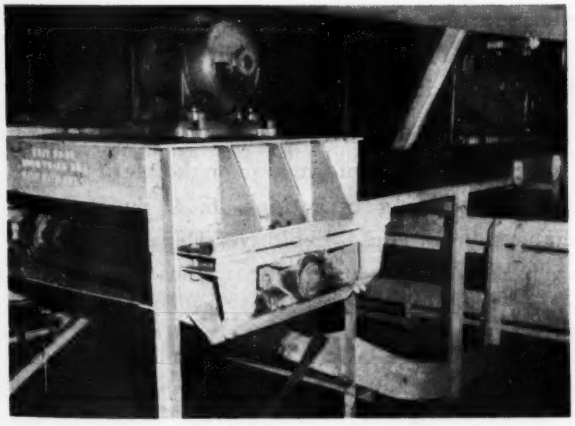


2 **Flow of coal through the plant** is maintained by electrified equipment driven largely by G-E motors, which account for almost all the plant's connected 4858 hp. Here are two of five G-E Tri-Clad* open (dripproof) 125-hp motors driving recirculating pumps that supply launders and wash boxes.

3 **Centralized control** for groups of motors in various sections of the plant is provided by eight G-E Cabinetrol* assemblies (one shown). These units, metal-enclosed for personnel protection and individual circuit isolation, come ready for quick installation.



4 **More efficient use of manpower** is made possible at the Ceredo plant by the use of this master control desk. It combines all 82 G-E push buttons and indicating lights in one location, thereby closely coordinating plant operations with minimum effort.



5 **From rotary dumps to loading booms,** plant's equipment is kept "on the go" by G-E Tri-Clad motors—triply protected against physical damage, electrical breakdown, and operating wear and tear. This Tri-Clad motor drives one of five rail loading boom conveyors.

* *Registered trade mark of General Electric Co.*

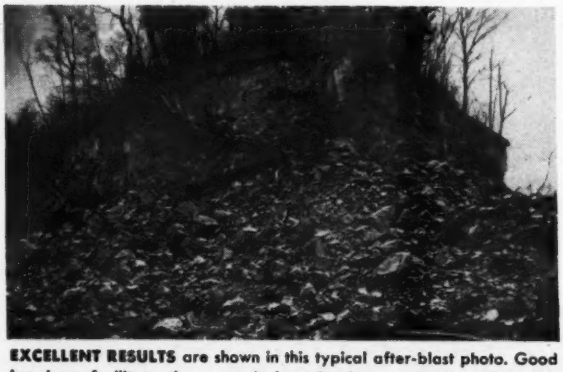
DRIVES
for
COAL PREPARATION PLANTS
—to cut clean-coal costs!

6 **"Electrified coal preparation,"** a 32-page photo-report, shows how modern coal preparation plants are applying electrified machinery to increase clean-coal output, reduce coal-processing costs. Ask your G-E representative about it, or write for Bulletin GEA-5308. *General Electric Company, Schenectady 5, N. Y.*

Excellent fragmentation combines with economy and safety at West Virginia stripping operation using Du Pont "Nitramon"

TYPICAL 40-FOOT SHALE overburden, with horizontal holes averaging 30 to 50 feet, ready for loading "Nitramon" charge. Note seam of coal.

"NITRAMON" is packed in easily handled, watertight metal containers and can be loaded immediately after drilling. It cannot be detonated with commercial blasting caps, and is insensitive to open flame, friction or falling objects. A "Nitramon" Primer—itself relatively insensitive—readily detonates the charges. In addition, since "Nitramon" contains no nitroglycerin, it eliminates the risk of headaches.



EXCELLENT RESULTS are shown in this typical after-blast photo. Good breakage facilitates the removal of overburden . . . speeds up the entire stripping operation.

WORK being done by Dippel & Dippel Coal Company for the West Virginia Mining and Consulting Company near Anawalt, W. Va., again illustrates the excellent results consistently obtained with Du Pont "Nitramon". . . the safest blasting agent known. The high degree of fragmentation achieved permits shovels to remove overburden quickly and economically.

"Nitramon" was selected for this coal-stripping operation because of its outstanding blasting efficiency and its superior safety characteristics. Economical, safe and easy to handle, it is the first choice of a large segment of the industry.

Any Du Pont Explosives representative will be glad to give you complete information on the use of "Nitramon" in stripping operations. E. I. du Pont de Nemours & Co. (Inc.), Explosives Department, Wilmington 98, Delaware.

DU PONT EXPLOSIVES

Blasting Supplies and Accessories

DU PONT

REG. U. S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

900 feet of trouble-free lubrication

• When operators of this midwest mine installed a conveyor in 1949, STANOBAR No. 2 Grease was selected as the lubricant for belt idler bearings on the recommendation of a Standard Oil lubrication specialist. Nine hundred feet long, and moving coal from mine bottom to tipple, the conveyor has boosted tonnage 300 to 400 tons a day.

There have been no bearing failures, no lubrication difficulties. STANOBAR is applied only twice a year.

STANOBAR's mechanical and chemical stability . . . the characteristics that have resulted in trouble-free lubrication of this conveyor . . . can also work to advantage in your own mine on a wide variety of jobs. Mine operators have found it especially valuable on ball and roller bearings which operate under a wide range of speeds and temperatures.

STANOBAR
TRADE MARK
Grease

A call to your local Standard Oil office is all that's necessary to put a Standard lubrication specialist to work on your problem. Or write: Standard Oil Company, 910 South Michigan Ave., Chicago 80, Ill.

What's your problem?

J. A. Grieve, lubrication specialist at Standard Oil's Decatur office helped this midwest mine make important savings with STANOBAR No. 2 Grease. He was close at hand, able to give mine operators the kind of service they needed when they needed it.

There's a corps of such lubrication specialists throughout the Midwest, one of whom is located near your own mine. Through special training, plus a background of practical experience, this man has a knowledge of lubrication that can mean real savings to you. To obtain his services, simply contact the nearest Standard Oil (Indiana) office. Discuss with him the savings you can make with such outstanding products as:

STANOIL Industrial Oils—Here's one line of oils that provides cleaner operation of loader and crane hydraulic units; supplies effective lubrication in compressors, gear cases, and circulating systems. One or two grades can replace a wide variety of special oils and lubricants.

CALUMET Viscous Lubricants—On open gears and wire ropes, these greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of gears and better internal lubrication of wire ropes.

STANDARD OIL COMPANY STANDARD *(Indiana)*

What's ahead for you?

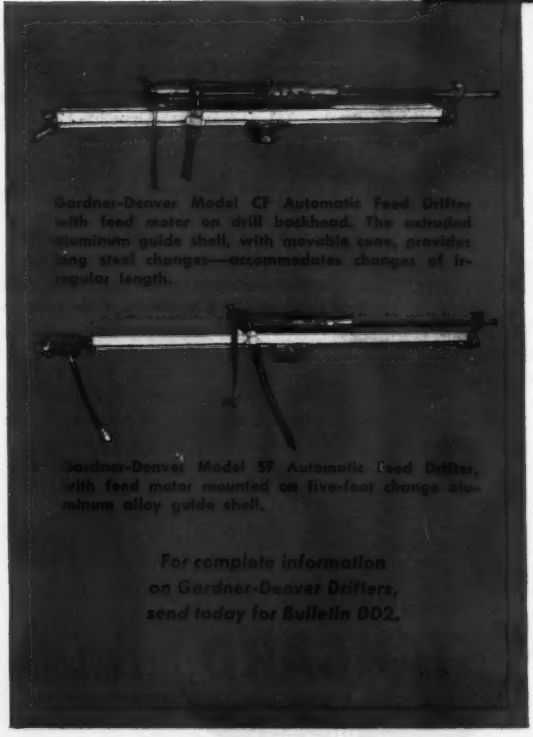
Increased demands for ore production from your mine?

A stepped-up development program to reach your ore reserves?

Hard rock you've got to "hole through" in a hurry?

A program to hold down production costs?

Gardner-Denver CF89H Automatic Feed Drifters.


Gardner-Denver Model CF Automatic Feed Drifter with feed motor on drill backhead. The extruded aluminum guide shell, with movable cone, provides long steel changes—accommodates changes of irregular length.
Gardner-Denver Model SF Automatic Feed Drifter, with feed motor mounted on five-foot change aluminum alloy guide shell.
For complete information on Gardner-Denver Drifters, send today for Bulletin DD2.

For help in solving mining problems such as these, choose famous Gardner-Denver Automatic Feed Drifters. They're designed by men who know what it takes to do a fast, low-cost drilling job underground.

The Gardner-Denver self-adjusting feed, for example, responds automatically to bit penetration — is automatically regulated by the type of ground being drilled. Maximum drilling speed is easily maintained—"green" miners drill almost as fast as "old-timers." The long-wearing, "slow-motion" piston feed motor is economical to operate, too—uses only 3% to 5% of the total air consumption of the drill.

SINCE 1859

GARDNER-DENVER

Gardner-Denver Company, Quincy, Illinois
In Canada: Gardner-Denver Company (Canada), Ltd., Toronto, Ontario

THE QUALITY LEADER IN COMPRESSORS, PUMPS AND ROCK DRILLS

Editorials

Volume 37 JOHN C. FOX, Editor September, 1951

Mine Liquidation

ALL items to be sold!! Miles of underground pipe and power cable—top grade mine rail in excellent condition, crushers, classifiers, assay equipment, hoists, conveyors, pumps, motors. Another of our producers of the metals and minerals so vital to civilization goes on the block. No reasonable offer refused. When the price of copper is at 24½ cents, lead at 17 cents, zinc at 17½ cents, and other metals prices proportionately high, why should any metal mine have to shut down?

Incentive-killing taxation is one reason of course. Mining companies—or individuals—will not search for new orebodies to replace those currently being depleted if all but a minor part of the profits from the exploitation of the rarely found economic orebody is gobbled up by the voracious tax collector.

Another and a major reason many mines cannot stay open even with the high prices prevailing for their products is the high cost of almost everything needed to keep them in operation. The chief commodity purchased by mining companies is not explosives, not machinery, not timber, not pipe or rails, but labor. In general, the cost of this commodity, or service, makes up 60 percent of the total cost to the producer of a ton of ore delivered to the mill.

It is no secret that the labor cost in all lines is one of the chief factors that pushes prices ever higher, contributing to inflation. It is agreed by all that inflation and Communism are the two enemies faced by the western world today. Our Government in an effort to control the former through its taxing powers is playing right into the hands of the latter. Karl Marx, the oracle of all Communists, once wrote that by increasing taxation the capitalist system could be broken down and fall easy prey to socialism. That a capitalistic democracy can stand more taxes than Marx thought possible is shown by the fact that our taxes are many times higher than the two percent Federal levy on income which it was argued 56 years ago was socialistic and confiscatory. We have survived that and will probably survive the present tax laws *if*—and we will come back to that "if" later.

At the present time we are being treated to an illustration of one of the classic patterns of inflations. The history of all great inflations shows that prices rise faster than wages. It is evident from the past, then, that not even highly organized labor can hope to keep up with the spiral of rising prices. Starting from a position well behind prices, each rise in the cost of labor merely accentuates the difference by pushing prices even higher. But regardless of consequences a union, expelled from the CIO because of the Communistic sympathies of its leaders, has recently called a strike in the nonferrous metals industry. Called it at a time when these metals are sorely needed to keep the defense effort keyed up to a high pitch. Do the leaders of this union have the best interest of their followers at heart or are they acting on orders, express or implied, from Moscow.

To the best of our knowledge there never has been a strike in which anyone came off a winner. The wages lost by the men, no matter what concessions they win, can never be regained. The production lost to the national economy can never be made up. Millions of workers in other industries feel the pinch when factories are forced to curtail operations because of shortages of raw materials.

Isn't it about time that the rank and file of labor unions, such as this one, questioned where their chiefs are leading them? Are they going to continue to sell their birthrights as Free American Workmen for a mess of pottage that can only contribute to the spiral of rising prices until Mine Liquidations are forced in increasing numbers; until Government is forced, in order to survive at all, to take over the production of the metals and minerals and we have a socialistic state and the walls of the Kremlin rock with laughter at how easily and bloodlessly the once mighty United States of America fell into the snare?

Workers throughout the world should make common cause not against the entrepreneurs who provide their living but against the oppressors who dictate where they shall work, when and how much they shall produce.

Inflation which robs their dollar of its purchasing power can be licked *if* (and this is the "if" mentioned above) production keeps pace with demand. Let "an honest day's work for an honest day's pay" be the slogan. Then inflation and Communism will both be stopped dead in their tracks.

Some of the most difficult mining support conditions anywhere are met in anthracite mining

Mechanical Mining In Anthracite

Two Accounts of How Machine Methods Have Been Applied to Pillar Recovery, Timbering and Rock Loading in the Anthracite Field

By W. I. STONEBRAKER,
Superintendent
Hudson Coal Co.
and
ELMER E. YOUNG,
Mining Engineer
Philadelphia and Reading Coal and Iron Co.

MANY years ago the anthracite operators began to experiment with mechanized equipment for mining, and for loading and transporting coal from the working face to the mine car, in order to offset increased costs of production. These increased costs resulted from rising wage rates, decreased demand for coal, due to inroads on sales made by competing fuels, and the necessity of mining greater tonnages from the thinner coal seams, and from caved and crushed ground areas of pillar coal.

Mechanical mining in anthracite covers a broad application of various types of equipment to some of the most difficult conditions encountered anywhere in coal mining. Minable coal measures penetrate to great depths and are separated by relatively strong stratified shales and sandstone varying in thickness from a few feet to as much as 250 ft. Orderly and proper mining of the coal makes it necessary to recover pillars in sequence from the top downward and where the rock strata between two beds is thin, the drawing of pillars in the upper one causes tremendous and concentrated pressures on those of the bed beneath. The resultant squeezing and caving retards the normal extraction of the coal from the latter.

Generally speaking, the application of machinery to anthracite mines that have been in active operation for 75 to 100 years has been a problem of adaptation of machine to method rather than development of a method THE Olyphant-Eddy Creek division however, where existing equipment, because of weight and rigidity, can not be used. The contours of the anthracite coal beds in flat-lying measures are irregular and, as a result, the gangways, breasts and pillar chutes frequently change direction. To be applicable under these conditions, mechanical conveying and loading equipment must be light in weight and sufficiently flexible to follow the changing alignments.

MECHANIZATION AT HUDSON COAL CO.

THE Olyphant-Eddy Creek division of the Hudson Coal Co. is located in the upper section of the northern anthracite field, about six miles from the city of Scranton, Pa. The property covers an area of 2544 acres. Mining is conducted at present in 12 of 14 coal beds that occur in the narrow basin. Some 67 miles of underground, narrow gauge haulage roads are in active service for the production of 7500 tons of run-of-mine coal per day. First mining, consisting of development and chamber work in the solid (mostly thin) coal, accounts for 40 percent of the output with the remain-

der coming from pillars. Mechanized equipment is used in producing 95 percent of the total production.

To attain this high degree of mechanization several types of equipment have been developed.

Undercutters, compressed air and electric drills were introduced for mining the coal. The double drum scraper loader, developed in the northern anthracite field, provided an economical method of mining thin beds by allowing elimination of the costly process of cutting top or bottom rock to make sufficient head room for the mine car to pass to the face. Scrapers of this type are still used quite extensively for mining thin coal from three ft down to as low as 18 in. in thickness. They are readily adaptable to all conditions irrespective of grade.

Double-drum, scraper-loader hoists mounted on a movable steel platform have proven an excellent means of driving slopes and planes in either coal or rock.

Conveyors Used Extensively

Conveyors of the chain, shaker and belt types were introduced next. As early as 1927 the Hudson Coal Co. began experimenting with shaker chutes. Pit car loaders, elevating and face conveyors were tried and found to be of some value under certain conditions. Uphill shaker conveyors were developed principally through extensive tests given the equipment in this area.

Of all the conveyors developed, the shaker chute emerged as the most useful in the recovery of pillar coal from areas previously first mined. The pillars that were left in the original mining proved inadequate in size to support the roof and as a result squeezes developed, causing it to collapse and completely fill the mine openings. The flexibility and small size of the shaker conveyor made it possible to take narrow skips following the irregular lines of these pillars and also to confine openings, through caves between pillars, to much smaller areas than those necessary for hand methods. Application of the shaker to this kind of pillar mining resulted in increased coal production and in a reduction of expenditures for handling caved rock.

Shaker conveyors were also applied to driving chambers or rooms and, where grades were favorable, the self-loading head or duckbill provided a means of loading the conveyor mechanically. Hudson Coal Co. made its first experiments with duckbills over twenty years ago and application of this equipment to chamber mining at the Olyphant-Eddy Creek mines division made possible production performances of 15-20 tons per man-day.

Timbering machine built in Hudson's shops stepped up gangway clearing

Drawing pillars in seams above cause tremendous concentrated pressures on beds below

Advancing of a gangway through caved area was speeded up 300 percent when loading machine was introduced

Light Weight Duckbill

One of the more recent developments for the anthracite region has been a small size duckbill known as a "Duckling." Experiments are now under way to determine its adaptability to conditions at Hudson Coal Co.

It was first used on a shaker conveyor advancing a narrow face for a distance of 250 ft from a tunnel between two coal beds to a point where a rock hole could be driven for the return air course. Shakers are used in this type of work, not only to obtain better performance but to simplify transportation, as cars can be handled in trips instead of singly. The place was 12 ft wide in a very dirty bed composed of 44 in. of coal in three benches and 47 in. of bone and rock. Grades varied from 18 percent on the rise to 3 percent on the dip. Two men were employed on each of two shifts per day and with the aid of the "Duckling" they were able to increase their performance 23 percent over the former method of hand shoveling onto a conveyor.

Next an experiment was undertaken to determine whether or not the small unit could be used as a substitute for the heavier duckbill in advancing chambers in 4½ ft of solid coal. One result of this experiment was decreased production, showing that it

should not be used to replace the larger unit.

Its most recent application is in conjunction with a light weight crosscut drive with hydraulic jack, in drawing pillars in a seam consisting of 16 and 30-in. benches of coal separated by 20 in. of bone and rock, where close propping is necessary for roof control. Sufficient time has not elapsed to draw final conclusion as to its adaptability to this work. However, the lighter weight equipment has won the favor of the workmen. The small crosscut drive can be quickly assembled to give any desired angle to the pan line along the pillar face and the "Duckling" is easily maneuvered in the loose coal between props and timber. Loading time has been reduced with a consequent increase in production.

Mechanical Loading and Timbering

Another successful application of machinery in connection with recovery of pillars at Olyphant during the past year has been the conversion from hand to machine loading in reopening a section of an upper bed that was first mined 75 years ago. A Joy loader was put in service cleaning up a gangway and aircourse driven along the strike of the bed in the original mining. Caves 4-14 ft in thickness were cleaned with the rate of advance by machine amounting to more than three times that obtained by the old method of hand loading to mine cars.

A timbering machine, built in the colliery shop, was used to expedite the work of standing heavy timber for roof support.

Results of these most recent experiments, using a mobile loading machine and timber setter for reopening development and a shaker conveyor with light weight duckbill for pillar removal, indicate that it will be possible to obtain maximum recovery of coal at a reasonable profit from all old pillar areas.

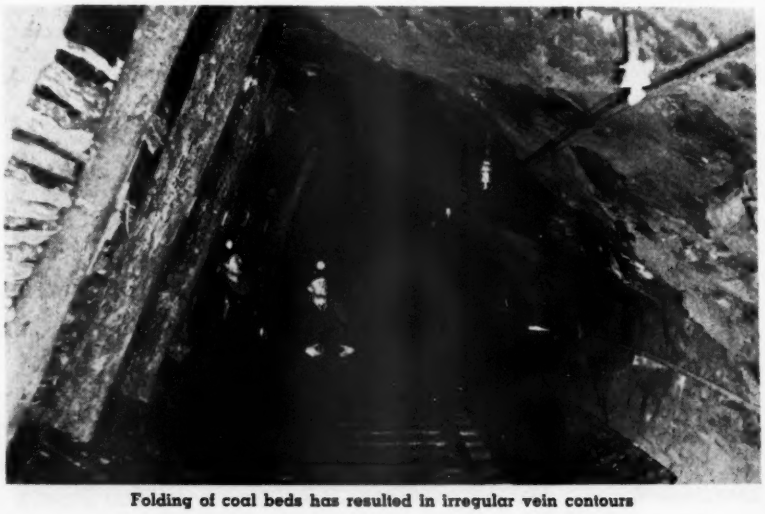
MINING AT MAPLE HILL COLLIERY

AT Maple Hill Colliery of the Philadelphia & Reading Coal & Iron Co., located in the western middle anthracite field approximately 15 miles north of Pottsville, Schuylkill County, Pa., in what is known as the Ellangowan Basin, the folding of the coal beds resulted in numerous anticlines, cynclines and slip faults with the result that the contours of all veins are very irregular. This mine has operated continuously since 1890 and coal has been mined from 12 veins 6-50 ft thick on pitches from 0 to 60°.

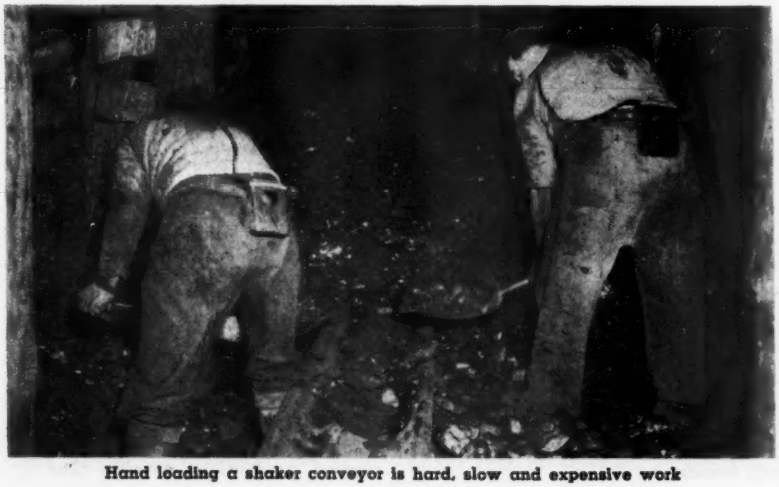
Difficult Pillar Recovery

Due to vein structure and overlying strata conditions, the reopening of closed haulageways to recover pillar coal was found uneconomical and it has become necessary to drive new haulageways in the bottom rock below the veins. Rock holes on 35° pitch are driven from the rock haulage to each individual pillar. Due to the irregularity of the veins, these rock holes vary from 20 to 150 ft in length. After the rock holes are driven, a chute 11 ft wide and 8 ft high is driven in the pillar with the pitch of coal bed until it holes into the overlying robbed mine workings.

Coal on either side of the chute is then skipped back, robbed and transported to the top of the rock holes by shaking conveyors, scrapers or belts where it is discharged into mine cars on the haulage gangways. The coal mined in driving the chutes and robbing is loaded on the conveyors by hand, delaying both the chute advancement and production. In thick veins, slant chutes are driven in the coal off the pillar-chute ribs and when robbed back, some coal is lost along the bottom slate and never recovered. All pillar-chutes are double-timbered with three-piece sets and on numerous occasions must be lagged and cribbed, depending on vein conditions. When the miners are thus engaged, chute advancement and production is at a standstill.



Folding of coal beds has resulted in irregular vein contours



Hand loading a shaker conveyor is hard, slow and expensive work

It is the opinion of the supervisory officials of the Philadelphia & Reading Coal & Iron Co. that if the coal mined in the pillar holes is loaded mechanically onto the conveyors it increases development, yardage, production and more of the coal left in pillars is recovered. The conventional duckbill was tried out, due to the limited size of openings—in turn dependent upon roof

and rib conditions—and the weight of this type of loading equipment, it was found that it could not readily be moved from one face to another and was impracticable for use in many areas in this region.

Scraper drags have been used successfully for loading from advancing chutes and pillar robbing. They have a definite advantage over other methods of loading equipment, especially when removing pillars that are at a lower level or down the pitch from haulage gangways.

Loading of coal on shaking conveyors is favored over other mechanical methods in the western middle and southern anthracite fields because their flexibility and light weight permit them to be easily and quickly dismantled and moved from one place to another. Development is also more rapid and this type of equipment has proven satisfactory and efficient in operation.

"Duckling" Loader Developed

These conditions were discussed with a manufacturer's representative and it was decided to develop a light, flexible duckbill that would discharge on an "0" conveyor pan; one that could be readily moved from one working face to another, easily handled in the rock holes and extended at the working face by two miners in as short a period of time as possible. After due consideration and planning, a miniature duckbill called the "Duckling" was built and put into operation in Maple Hill mine, December 5, 1950. This weighs approximately 450 lb and consists of a loading head 32 in. in length by 30 in. in width. The telescopic extension trough and driving mechanism is 10 ft long, giving a total over-all length of 12 ft 8 in. The complete assembly was taken up a rock hole 105 ft long on 35° pitch and completely installed in a top split pillar chute by three men in two days at a cost of $76.74.

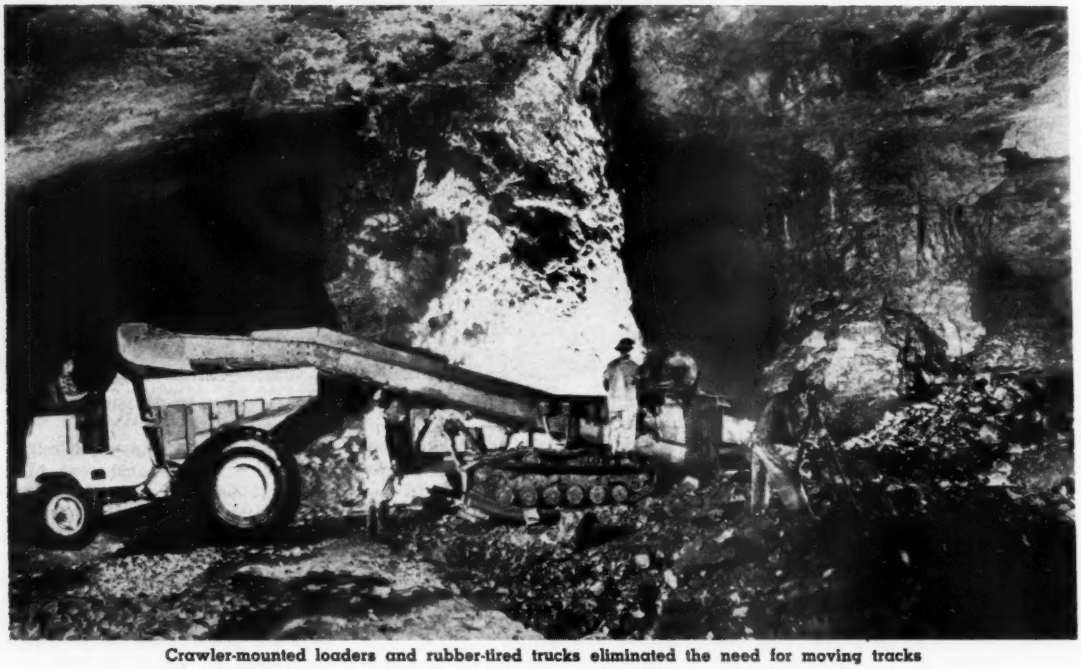
The "duckling" increased performance of labor by 23 percent

In advancing the pillar hole the miners were required to drill, load and fire ten 8-ft holes per cut which produced 5 cars (126 cu ft capacity) of coal per shift. This coal was loaded with the "Duckling" in 25 minutes. The three-piece timber sets with 7 ft collars were carried from the top of the rock hole and stood, lagged and cribbed for each cut. The face was then squared off and made ready for the next shift's advancement. During the first half of December, 1950, a pillar hole driven with this method advanced 4.7 ft per day more than an adjoining pillar hole driven in the conventional manner, while production increased 4.4 cars or 12.3 net prepared tons per day. Less retimbering was required due to the more rapid advancement of the pillar hole.

Robbing of pillars has not been attempted with the "Duckling" at Maple Hill Colliery but from present performances, there is no doubt that considerable coal lost by hand-loading can be recovered with this equipment. It may also have application in driving counter gangways and for reopening and driving ventilation headings.

Mechanical haulage has done much to increase production

Mechanization at Fredericktown



Crawler-mounted loaders and rubber-tired trucks eliminated the need for moving tracks

Consolidation of Two Mines; Diesel-Powered, Rubber-Tired Equipment, and Modern Drilling and Shooting Techniques Result in Increased Efficiency and Production

By SHERMAN A. WHITE
and
J. A. ROOD
National Lead Co.

PARTIAL underground mechanization, including the use of diesel truck haulage, diesel powered loading equipment, and jumbo drilling, has been achieved at the Fredericktown, Mo. mines of National Lead Co., St. Louis Smelting and Refining Division.

Increasing costs of the postwar period and a growing belief that high metal prices would eventually drop led to the careful step-by-step plans which have been completed with appreciable success.

A brief review of the factors responsible for the decision to mechanize begins with a description of mining practice prior to December 1949. Ore was produced from three separate shafts. No. 5 shaft is 500 ft from the crushing plant, No. 1 shaft about one-half mile south, and No. 2 shaft about two miles south and west. The three shafts were not connected underground.

Three Separate Operations

Each mine had its separate underground haulage and its own distinct type of shaft, headframe, and surface plant. No. 1 was a can hoisting shaft; i.e., ore was hoisted in cans of about 0.6 ton capacity and dumped into a surface hopper. This type of hoisting was once almost universally used in the Joplin District and proved economical and feasible for hoisting the more or less shallow zinc ores of that area. At No. 5 shaft the ore was, and still is, hoisted in balance through a standard three-compartment shaft by means of two skips of 2.1 tons capacity each. The mechanization program herein described applies only to No. 1 and No. 5 mines, the two which are relatively close together.

Mining was carried out on the room and pillar method at approximately the same level in both mines. Ore was broken in stopes 30-35 ft wide and 10-18 ft high, depending on the distribution of mineralization. Pillars were spotted in a diamond pattern, and varied in diameter from 20 to 25 ft. Drilling was accomplished by means of HD-10 machines, mounted on six-ft column bars, using a "sawtooth" pattern for slabbing.

Broken ore was loaded on the underground railroad (cars being used in No. 5 mine and cans in No. 1 mine) by three-drum electric scraper hoists, mounted on electrically driven crawler type, portable ramps. Loads were trammed by storage battery motors to their respective shafts. At No. 5 mine, the ore was dumped onto a grizzly from which it fell into a skip pocket and was drawn into the skips for hoisting to the surface. At No. 1 mine, the cans were hoisted to the surface and dumped into an elevated hopper.

System Had Faults

Disadvantages of the above system were numerous. At No. 1 mine experience of several years proved that an average of 550 cans was the most that could be hoisted in an eight-hour shift. As the working faces progressed away from the shaft, this capacity could be expected to decrease proportionately. Where scraper loading was utilized, there was always the problem of expensive and extensive track moves to keep the loading equipment close to the face. When barren ground was encountered, there was little flexibility and fast track changes to meet new mining conditions and production schedules could not always be made.

With ample capacity at No. 5 to

hoist all the ore produced in No. 1 and No. 5 shafts, hoisting was unnecessarily duplicated. The routing of supplies to different locations and the necessity for maintaining duplicate facilities, such as change rooms, powder houses, and shops in both mines, obviously contributed to high cost operation. Maintenance and supervision performance, not to mention bookkeeping and cost accounting, also suffered by the separate unit setup. Not only would mechanization eliminate the worst features of this method, but greater efficiencies could be expected through conversion to diesel and rubber-tired equipment. At the same time, it was thought that jumbo drilling would provide the larger rock piles necessary for a stepped-up production schedule at No. 1 mine.

Rubber tires and diesel power add speed and flexibility to ore haulage system

Truck Tunnel Planned

Final draft of the plan called for the driving of a 900-ft truck haulage tunnel to connect the mines. This was to be driven from both sides, and all ore produced from the No. 1 side hauled through the drift by 7½-ton diesel trucks. It was planned to dump this ore into a separate pocket to avoid interference with railroad dumping facilities at No. 5 shaft.

While the 900-ft drift was the principal item of mining expenditure, it was also necessary to construct approximately 2000 ft of mine roads, approaches and turnouts. Work consisted mainly in raising the back, taking up sill, and filling. Excavation was also required for the 250-ton underground pocket to be located above the railroad terminal. All underground excavation was to be carried on at the same time, with a fixed termination date organized not to interfere with normal production. Although 300-400 tons were being hoisted through No. 5 shaft, it was planned to eliminate one shift there and increase production at No. 1 mine. This could be accomplished with the same number of men by utilizing the added available work hours made possible through use of new equipment.

Thus in the future, approximately 1100 tons per day would be hoisted through No. 5 shaft. This required increased surge capacity, on the surface, to prevent a bottleneck of mine production. Accordingly, contracts were given for the purchase and erection of a new 400-ton steel hopper, from which surface trucks could haul the ore to the mill about 500 ft away.

Large Equipment Assembled in Mine

By February 1, 1950, three 7½-ton diesel powered trucks had been purchased, and one placed in service underground at No. 1. Lowering the trucks through the No. 1 shaft involved disassembly on the surface and reassembly in the mine. As the shaft was too small for the passage of a truck body, these had to be cut and lowered in sections, then welded together again underground.

The same procedure was necessary to bring the diesel powered, 104 rocker shovel underground. Further additions of equipment were two D-4 air driven, crawler type jumbos, one carrying DA 30 drifters on four-ft aluminum, sliding cone sashes. The other jumbo, of the same basic type but rebuilt in the mine shops to allow greater stability on steep rock piles, bore hydraulic jibs from which hung two drill machines. In subsequent operations this jumbo proved to have the greater versatility, both in drilling and mobility.

It was decided to drive the drift by contract, and accordingly, by the union bid system, four men were selected for the work. None of the men had ever driven a tunnel of this size, nor had they managed the equipment selected for the job. Thus the problem was to determine what the men could accomplish and produce a smooth cycle that would obtain the greatest advance on a two shift basis.

Following some experimentation the burn-V round was adopted as standard for best breakage of the horizontal, bedded limestones. This round was adapted from experiments made by the St. Joseph Lead Co. Best advance for a two week period was ten ft in two, eight-hour shifts.

Loading ore into cans of 0.6 tons capacity necessitated expensive and extensive track moves

Tunneling Method

This was achieved on the No. 1 side by the following means. First half-hour of the day shift was spent in hanging ventube and removing the fumes from the blast of the preceding evening shift. As the drift was driven under the mill tailing pond, where no churn drill holes existed or could be drilled, special precautions had to be taken in the use of the diesel equip-

ment to prevent and to detect the presence of dangerous gasses. These measures included testing by an engineer of the air several times each mucking shift, and the use of kerosene fuel in the trucks and loader. Twenty-four-in. sail was carried as close to the working face as possible to provide an air volume of 6500 cfm.

With the face clear of blasting fumes, the rocker shovel was moved in and the mucking done in from three to three and one-half hours. Several rounds were disposed of at the rate of 100 tph; however, this was the exception and not the rule.

Drilling by jumbo was usually begun immediately after the lunch period, with the placing of the cuts under the supervision of a foreman. With the cut and relief holes accurately drilled, the night crew was able to complete the remainder of the 36-38 hole round.

mucking with a scraper hoist mounted on the rear of a D-4 bulldozer. Mucking was accomplished by dragging the rock sufficiently far from the face to allow entrance of both bulldozer and jumbo. The drillers could then proceed with the round while the rock was being bulldozed to the portal and from there into an unused sump. While this system could be successful for short distances only, every foot gained saved a costly ventilation outlay on the No. 1 side.

During June 1950 (only one week after completion of the drift), ore from No. 1 was being hoisted at No. 5 shaft. In the meantime, installation of a 75,000 cfm ventilating fan had increased the supply of fresh air and insured proper flow through the mine.

With the shutdown of the No. 1 shaft and the discontinuance of the railroad, many man hours were saved.

Engineers check mining progress carefully as step-by-step plans are carried out

At times the men were given help with the charging, especially if delays for which they could not be held responsible had been encountered.

Use Fast Delay Caps

Millisecond delay blasting caps were selected for their greater fragmentation qualities. Series wiring was used in the drift but later experimentation proved that fewer failures occur when the caps are wired in parallel. This was especially true in the stopes and wet areas of the mines where highly conductive conditions often led the current to ground. These conditions were largely overcome by using a special wiring system, and firing parallel wired rounds with 440 v current. Some experiments in series wiring with arc-resisting caps were tried, but without success.

From No. 5 mine, 200 ft of the haulage drift was driven by day men using the jib-mounted jumbo and

It was still necessary to improve the drilling method, not only to increase the efficiency of this operation, but also to provide more rock for the extra loading hours available. In experiments now being carried on, emphasis is placed on standardization of rounds, lighter equipment, and methods to insure more footage per drill shift.

Long-Wall Mining Tried

In order to take full advantage of the greater efficiencies attributed to jumbo drilling, it was decided to experiment with long-wall methods, and instead of shaping round pillars, turn square ones. Using the drift round as a base, a 35-ft wide by 18-ft high stope is driven by means of a ten-ft bench. Following mucking of the preceding round, this bench is drilled and blasted then dozed flat. Leveling of this rock requires very little time and saves valuable hours of maneuvering the jumbo. The round in the heading is then ready for drilling, and the equipment remains there until the round is completely drilled out. As each jumbo is assigned a given number of headings, there is no waste motion in getting to work at the start of the shift. The round is standard, the stope has been prepared, and the men by repetition know what is expected. As in drift driving, all blasting circuits are wired parallel, unless otherwise specified, by the shift foreman. Special powder crews charge the rounds and wire them on evening shift. All rounds are blasted by the foreman from his office by means of a newly installed safety system. As many as 240 holes per shift in scattered sections of the mine have been blasted over this system without a failure.

In planning loading operations, it was felt that the diesel loader should bear the brunt of the work and that the drags should be kept in readiness as standbys in case of breakdowns. In every area, there are usually two rock piles available for loading. Practice is to give the larger to the shovel, while a drag is set on the smaller. A system of signal lights tell incoming truck drivers to which equipment and area to go for loading.

Underground Maintenance Shop

A well equipped shop for the maintenance of all machinery, other than electric, has been installed underground and already has justified the investment. To foster preventive maintenance each operator is being trained in the greasing and minor adjustment of his own particular equipment. An office has been provided where maps, mine reports, and equipment records are at hand when needed.

In the workmen's attitude toward these changes disbelief and minor opposition have given way to acceptance and pride in accomplishment. Foremen and men alike agree that the work load has been decreased, and that the changes represent a step forward. The men have acquired new skills with, in some cases, promotions in jobs and pay raises.

Many of the "bugs" encountered in the process of changeover have been due to the human element. The miners have been drawn from an agricultural background, so extensive on-the-job training has been necessary. It was not expected that these men would present a perfect performance record, but it was believed that with their confidence and cooperation the job would improve—and it has. As a result of the downtrend in costs, plans are being laid for further mechanization. Each step must be based on previous results, present costs, ground conditions, markets, etc. Secure in the knowledge that a forward step has been taken, mechanization at Fredericktown is here to stay.

Use of roof bolts allows wider clearance along haulageways

Economy of Roof Bolting

A Report of the Roof Committee Comparing Costs of Timbering and Roof Bolting at Ten Representative Coal Mining Operations

By GEORGE N. McLELLAN,
Sub-committee Chairman

ROOF bolting has proven its practicability as a method of coal mine roof support. It is not applicable to all seams but it has become accepted practice in many mines and further installations are expected to extend its use throughout the coal fields. The growth of the practice is so rapid that the study presented here is considered to be in the nature of a progress report. The committee recognizes that bolting technique and equipment are still in the process of development. However, the point has been reached by a number of mining companies where some conclusions can be accepted, always keeping in mind that the results of today may be amplified in the operations of tomorrow.

In the mines where bolting has been successful, it has proven to be a method of roof support much superior to conventional timbering in preventing slate falls. There are additional and what might be termed indirect or corollary advantages. These include reduced supply handling, improved ventilation by the elimination of obstructing timbers, reduction of accidents through reduction of slate falls and safer, faster haulage because of wider clearance along the roadways. In addition, an item of major importance is the increased coal production due to better operating time by having no delays from roof trouble. An outstanding example of this condition exists at a property where roof bolting was successful in holding a top that could not be supported for economical mining with conventional timbering.

These factors, as well as some others, have a favorable effect on the mining cost. All have been covered in various reports and published articles so it is not the purpose of the committee to discuss them here but rather to confine this report to a consideration of the direct cost of roof bolting compared with similar costs of roof support by conventional timbering. Such comparisons are made possible by actual operating records, furnished to the committee by ten coal companies. These data are listed in the accompanying tables. All data is reduced to the common denominator of driving an entry or room and supporting the roof over a distance of 1000 lineal feet. This basis was taken so that the costs of the two methods can be readily compared, but it should be understood that such comparisons apply only within each individual mine. The costs in one mine should

Notice that slate that had to be removed in this timbered entry

not be considered as relating in any way to the costs of any of the others listed.

The data cover the items that go into the direct cost of roof support and also give the length and spacing of roof bolts as well as the sizes of timbers. Incorporated in several of the reports are the tons of coal mined per cut or per 1000 ft of entry, and the amount of rock or slate handled. The width of entry or room is noted because it has proven possible in many mines to increase the width of the working places with roof bolting and thus secure greater tonnages per cut. However, Mine D is the only one, of the ten listed, where this has been done.

It was the original opinion of the committee members (and probably many others in the industry) that actual roof bolting material and installation costs would be somewhat greater than that of conventional timbering. This has not proven to be the case in the ten mines studied. Except for the rock tunnel, listed as Mine A, there are no great differences either way. Six show roof bolting to be more costly than timbering while at three the reverse is true; the average increased cost at the six mines is six percent, while in the others the decrease is 7.6 percent. Taking all of the operations into consideration, the average bolting cost was 3.8 percent higher than the average timbering cost. However, this is not the whole story.

Save on Rock Handling

There is a direct cost saving in roof bolting which results through the elimination of rock handling. A quick view of how these savings apply is shown in the following summary of costs taken from the reports of the individual mines.

Mine	Bolting Cost	Timbering Cost
A	$3,939	$18,298
B	2,098	1,869*
C	1,010	1,598*
D	1,997†	1,598
E	1,834	2,242*
F	1,855	1,821*
G	2,223	1,873*
H	1,585	1,240*
I	2,046	1,868*
J	1,755	2,233

* Plus cost of rock handling.

† Increased coal per cut.

As indicated in the foregoing tabulation and detailed in the following accounts, seven of the ten mines report reductions in the rock yardage where roof bolting is used.

Mine B. An entry 15 ft wide driven 1000 ft produces approximately 4200 tons of coal. With conventional timbering there were 840 tons of roof rock to handle—equal to 20 percent of the coal tonnage. With roof bolting the rock work was reduced to zero.

COMPARISONS OF MINE ROOF BOLTING AND TIMBERING COSTS
Based on installations in 1000 lineal feet of entry or room

MINE A—Rock Tunnel—Anthracite

BOLTING COSTS		TIMBERING COSTS	
Tunnel 14 ft wide has bolts five to six ft long on four-ft centers.		Tunnel 14 ft wide is timbered with three-piece sets of 12 by 12 in. sawed posts and cross bars.	
Handling supplies	$583.15	Handling supplies	$1,038.00
Roof drilling	952.32	Setting timbers	10,008.00
Installing bolts	815.93		
Total labor	$2,351.40	Total labor	$11,046.00
Bolts and anchors	1,588.43	Lumber cost	7,252.00
TOTAL COST—1000 ft.	$3,939.83	TOTAL COST—1000 ft.	$18,298.00

MINE B—Entries 15 ft wide

BOLTING COSTS		TIMBERING COSTS	
Bolts six ft eight in. long are set on four-ft centers.		Posts and cross bars are set on five-ft centers.	
Outside handling	$6.71	Outside handling	$15.00
Underground haulage	11.49	Underground haulage	52.65
Handling to face	5.61	Handling to face	41.88
Installing bolts	683.33	Setting timbers	1,246.56
Total labor	$707.14	Total labor	$1,356.09
Bolts and anchors	1,339.40	Lumber cost	512.50
Drilling supplies	51.25		
TOTAL COST—1000 ft.	$2,097.79	TOTAL COST—1000 ft.	$1,868.59

MINE C—Entries 16 ft wide

BOLTING COSTS		TIMBERING COSTS	
Bolts 42 in. long are set on four-ft centers.		Posts, five by seven in. cross bars, and cribbing.	
Outside handling	$7.45	Outside handling	$27.15
Inside transportation	14.65	Inside transportation	54.45
Roof drilling	177.00	Handling to face	109.20
Installing bolts	173.52	Setting timbers	645.00
Total labor	$372.82	Total labor	$835.80
Bolts and anchors	592.50	Lumber cost	675.00
Drilling supplies	45.00	Cribbing, rail, etc.	87.25
TOTAL COST—1000 ft.	$1,010.32	TOTAL COST—1000 ft.	$1,598.05

MINE D—Rooms

BOLTING COSTS		TIMBERING COSTS	
Rooms 30 ft wide with bolts 42 in. long on four-ft centers.		Rooms 18 ft wide are timbered with posts and five by seven-in. cross bars.	
Outside handling	$10.88	Outside handling	$27.15
Inside transportation	21.70	Inside transportation	54.45
Roof drilling	260.00	Handling to face	109.20
Installing bolts	352.50	Setting timbers	645.00
Total labor	$512.50	Total labor	$835.80
Bolts and anchors	1,380.00	Lumber cost	675.00
Drilling supplies	105.00	Cribbing, rail, etc.	87.25
TOTAL COST—1000 ft.	$1,997.50	TOTAL COST—1000 ft.	$1,598.05

MINE E—Rooms 16 ft wide

BOLTING COSTS		TIMBERING COSTS	
Bolts five ft long are set on four-ft centers.		Timbered with posts and cross bars.	
Outside handling	$9.75	Outside handling	$22.00
Inside transportation	5.85	Inside transportation	47.65
Handling to face	3.90	Handling to face	38.55
Installing bolts	500.00	Setting timbers	1,458.70
Total labor	$519.50	Total labor	$1,566.90
Bolts and anchors	1,250.00	Lumber cost	675.00
Drilling supplies	64.25		
TOTAL COST—1000 ft.	$1,833.75	TOTAL COST—1000 ft.	$2,241.90

MINE F—Rooms 18 ft wide

BOLTING COSTS		TIMBERING COSTS	
Bolts five ft long are set on four-ft centers.		Timbered with posts and cross bars.	
Outside handling	$8.40	Outside handling	$18.00
Inside transportation	4.75	Inside transportation	37.50
Installing bolts	550.00	Handling to face	34.00
		Setting timbers	1,191.70
Total labor	$563.15	Total labor	$1,281.20
Bolts and anchors	1,215.00	Lumber cost	540.00
Drilling supplies	76.85		
TOTAL COST—1000 ft.	$1,855.00	TOTAL COST—1000 ft.	$1,821.20

(*Continued on next page*)

MINE G—Rooms 16 ft wide

BOLTING COSTS		TIMBERING COSTS	
Bolts four ft long are set on four-ft centers.		Timbered with posts and cross bars.	
Outside handling and inside transportation	$31.00	Outside handling	$62.00
Drilling and bolting	858.00	Inside transportation	62.00
		Handling to face	16.00
		Setting timbers	1,170.00
Total labor	$889.00	Total labor	$1,310.00
Bolts, anchors, drills	1,334.00	Lumber cost	563.00
TOTAL COST—1000 ft.	$2,223.00	TOTAL COST—1000 ft.	$1,873.00

MINE H—Entries 15 ft wide

BOLTING COSTS		TIMBERING COSTS	
Bolts 42 in. long are set on four-ft centers.		Timbered with posts and cross bars.	
Outside handling	$45.00	Outside handling	$120.00
Inside transportation	65.00	Inside transportation	150.00
Handling to face	60.00	Handling to face	80.00
Roof drilling	200.00	Setting timbers	270.00
Installing bolts	110.00		
Total labor	$480.00	Total labor	$620.00
Bolts and anchors	805.00	Lumber cost	620.32
Drilling supplies	300.00		
TOTAL COST—1000 ft.	$1,585.00	TOTAL COST—1000 ft.	$1,240.32

MINE I—Gangway 15 ft wide (Anthracite)

BOLTING COSTS		TIMBERING COSTS	
Bolts 7½ ft long are set on four-ft centers.		Timbered with posts and round cross bars.	
Outside handling	$6.71	Outside handling	$15.00
Inside transportation	11.49	Inside transportation	52.65
Handling to face	5.61	Handling to face	41.88
Installing bolts	683.33	Setting timbers	1,246.56
Total labor	$707.14	Total labor	$1,356.09
Bolts and anchors	1,339.40	Lumber cost	512.50
TOTAL COST—1000 ft.	$2,046.54	TOTAL COST—1000 ft.	$1,868.59

MINE J—Entry 12 ft wide

BOLTING COSTS		TIMBERING COSTS	
Bolts five ft long are set on four-ft centers.		Timbered with posts and cross bars.	
Transportation and handling costs not available.*		Outside handling	$30.40
Installing bolts	$701.22	Inside transportation	43.00
Material cost	1,053.48	Setting timbers	1,640.00
		Total labor	$1,713.40
		Lumber cost	520.00
TOTAL COST—1000 ft.	$1,754.70	TOTAL COST—1000 ft.	$2,233.40

*Note: This installation was experimental at time data was compiled.

Mine C. Tonnage figures are not available but the management of this mine reports that with roof bolting the rock work was reduced to about 10 percent of the quantity formerly handled with timbering.

Mine D. Rooms were widened from 18 ft timbered, to 30 ft with roof bolting, increasing the coal per cut from 35.5 to 59.2 tons.

Mine E. An entry 16 ft wide driven 1000 ft produces 3744 tons of coal. With timbering there were 320 tons of rock to be handled in this distance; roof bolting reduced this to 100 tons.

Mine F. An advance of 1000 lineal feet in rooms 18 ft wide produced 4800 tons of coal. With conventional timbering there were 400 tons of roof rock to be handled; bolting reduced this quantity to approximately 100 tons.

Mine G. In an advance of 1000 lineal feet in rooms 16 ft wide with conventional timbering there were 1920 tons of rock to be handled. Roof bolting reduced this to zero.

Mine H. In driving a 15-ft entry a distance of 1000 ft, with conventional timbering the rock handled ranged from 1200 to 2400 tons. Roof bolting reduced the rock work to zero.

Mine I. In driving a 15-ft entry a distance of 1000 ft, with conventional timbering, there were 840 tons of roof rock to be handled. Bolting reduced this to zero.

The actual savings in dollars and cents cannot be given here because the reports do not indicate how this slate is handled—whether it is gobbed inside or hauled to the surface. However, the savings are substantial as each reader can easily determine by applying the yardage figures to his own mine. Then there is another item. Where it is the practice to load slate into mine cars and haul it to the surface, a reduction in the rock tonnage handled will result in an increased coal tonnage produced by a mechanical loading unit, which in turn will mean a further credit to the roof bolting cost. As a point of further interest, attention is called to Mine D, where an increased room width raises the coal per cut from 35.5 to 59.2 tons—67 percent increased production from each operating cycle.

Due to the limited number of mines reporting, the committee feels that these figures may not apply to the industry as a whole. However, taking all factors, direct and indirect, into account, it is felt that in most mines a study will show the costs of the two roof support methods to be fairly equal. This means that the installation cost should not be the primary factor in deciding whether or not to adopt roof bolting, because the other advantages may outweigh any slight cost differences that exist.

There is less supply handling with roof bolts

Light drill mounted on pneumatic leg has improved methods of drilling and reduced physical labor

Light Weight Drill Combination Used in Canadian Mines

By J. C. HEASLIP and T. N. DAWSON,
Canadian Ingersoll-Rand Co., Ltd.

THE evolution of rock drills has been a long and highly diversified effort which has culminated in the rather highly refined drilling machines which we know today. Whether by virtue of the fact that rock drills have now been developed to a degree where further progress in design is relatively difficult, or whether because of the spectacular possibilities shown by detachable bits and especially those with tungsten carbide inserts, there is little doubt that the cutting face of the drilling unit has recently been a major item of rock drilling research and now commands the attention of the rock drilling fraternity.

When Jackhamers in combination with air feed legs were first introduced, the true value and application of the equipment was not apparent due to its inability to function efficiently with steel bits. With the development of the small diameter tungsten carbide bits, however, the problem of drilling rock with the light weight equipment was solved, and with this in mind the Jackhamer air feed leg possibilities were again explored. The Canadian mine operators were eager to investigate the possible savings and application of this equipment combination. Subsequent results now clearly indicate that this combination has found a place in Canadian mining practice.

The possibility of using the lighter drill mounted on a controlled pneumatic leg has promoted basic improvements in drilling methods and provided an answer to the need for relieving the heavy labor of conventional rock drilling practice. This is particularly true in the case of rock drilling which has to be handled in difficult mine locations. Transportation of the light weight equipment makes the work considerably easier for the miners, and has the effect of speeding up the over-all operation.

Most mining properties consider

Teaming up the light weight pneumatic drill, air leg feed and tungsten carbide bits has created a new era in rock drilling. The lighter equipment eases the miners' load and speeds production.

this combination for selected applications only such as stoping, slashing, taking down back, sub-level drifting and station cutting in shaft sinking operations. Considerable testing is being done in drifting and cross-cutting where conditions are favorable. Generally, however, in most drift development headings, the use of the mounted drifter on bars or jumbos together with small gauge Carset Jackbits is still favored.

Naturally this revolutionary change in drilling practice, i. e., using Jackhamers and air feed legs has created immense interest and a recent survey brings to light the following reasons for this combination's popularity.

(1) Increase in footage drilled per shift, anywhere from 30 to 50 per cent—where applicable.
(2) 50 percent saving in capital outlay.
(3) Appreciable saving in air.
(4) No set-up time.
(5) Saving in powder due to smaller diameter holes and better distribution.
(6) Increase of 20 per cent in available drilling time.
(7) Ease of handling light equipment resulting in less fatigue on operator.
(8) Use of longer steel changes.

It is generally accepted that these facts have resulted in increased tonnage broken per man shift—or lower cost per ton broken.

Description of Equipment

Jackhamers are the standard 45 or 55 lb class drill and are available fitted with collar chuck and steel holder for ⅞ or 1-in. hexagon collared drill steel or plain shanks in either hexagon or Q.O. drill steel. All machines are fitted with faster than standard rotation.

An air feed leg is a simple air feed mounting especially designed to mount the above type Jackhamer. It is so constructed that although built to withstand hard service the weight is kept to a minimum. It is equipped with a specially constructed "rolling type" throttle which controls the feed. The air-operated feed leg helps to support the drill, feeds it into the rock and absorbs the recoil.

Lightening of the load on the miner permits more uniform drilling throughout the shift with resultant increase in footage and lower drilling costs. It has been found that the air feed leg operates most efficiently at a 35° angle with the horizontal when drilling horizontal holes. At this 35° angle, the vertical component of force exerted by the air feed leg as a lifting force is 73 lb. This is offset by the weight of the drill plus a slight effort of the operator pulling down.

Downward force (pull) that the operator must exert depends upon the angle of the air feed leg. In this case it is 11 lb. This small amount of effort makes drilling easier. The weight of the drill acts at the combined center of gravity of the drill and drill rod, which is vertically in line with the point of attachment with the air feed leg. This, plus a small downward pull by the operator, overcomes the lifting force of the air feed leg. Thus the machine is held in line and drills a straight hole.

Currently several makes of tungsten carbide detachable bits are being used in addition to single insert chisel type bits, solid in the end of rod. The detachable bits are offered in the four-point and chisel type variety.

Medium or light weight drifter drills using tungsten carbide bits may continue to dominate in tunnel work

Stoper drills will still have the advantage in raise work where holes are steeply inclined

Easy to Operate

Operation of the Jackhamer-air feed leg is easily mastered after a few shifts of instruction by a trained operator. Miners soon show a preference for the unit equipment because it saves setting up time and eliminates the "bull" work which exists with standard Leyner equipment. Drilling of horizontal or nearly horizontal holes with a Leyner in a stope was, before the advent of the Jackhamer-Jackleg, very hard work. Now savings in setting up time are utilized in drilling extra footage, and because of the portability features miners can continue drilling for longer periods.

Application of this equipment to square-set, rill, breast, and slash stoping, where set-up time is predominant, has increased the production as much as 50 percent—thus reducing the cost per ton broken. Drilling is easier; it makes a one-man job of what may have been hard work for two men. The present practice with the one-man machine is to equip each miner with a unit which permits greater footage drilled per shift. In properties where the equipment can be used to advantage the consensus of opinion indicates that existing drilling equipment will be replaced.

There is still a controversy whether this lightweight drill and air leg combination is efficient for main level developments such as cross-cuts and drifts. Some success has been experienced in soft or medium ground where drilling speeds up to 12 or 14 in. per minute can be maintained, but in the hard abrasive rock where the drilling speed and gauge of the bit is affected Leyner and tungsten carbide bits are the most efficient. Automatic boom jumbos can add to over-all efficiency. If a cycle of operation can be maintained in a heading by using Jackhamer and air feed legs the equipment will save on initial cost and allow increased portability from one working place to another.

No truck is required for transporting the equipment away from the face; one man can easily carry the complete unit. The mucking machine can be left a safe distance from the face without the necessity of switching. If large bore headings are required a portable staging can be fabricated for ease in drilling the top holes of the round. At present there are several properties interested in the drill and air pusher combination for main level development.

Valuable in Development Work

The equipment has proved invaluable for large ore body development, sub-drifting, undercutting in raises, station cutting in shafts, and taking the place of tripods in open stopes. Each working place will be dealt with in brief with emphasis on the advantages gained by the use of the portable unit. In large ore bodies the usual method of raise development is carried out. Then, by using a short two ft leg, sub-drifting can be started from the raise without the necessity of Leyners, cross bars and standard equipment. Once the sub-drift is started, longer legs can be used. Several headings can be operated at the same time, and in some cases two or even three rounds can be drilled in a shift.

The short leg is also used for undercutting in raises which have been developed for slusher production. This method also eliminates Leyners, crossbars and standard equipment and adds tremendously to greater footage and lower costs.

Shaft sinking costs have been lowered considerably and work effort decreased by utilizing the Jackhamer and carbide bit as a sinker unit; then assembling on the air feed leg for station cutting and "muck" pocket development.

In large open stopes it is sometimes necessary to slash and bench—this work is particularly applicable for the pneumatically fed Jackhamer. Holes can be drilled at any angle with ease. Starting holes is no problem due to the unit being unattached to any rigid support. The starting bit can be positioned flat against the point where the hole is to be drilled and the whole unit lined up with little effort from the operator.

Light equipment performs best in stopes where most holes are horizontal

Tungsten Carbide Bits

Since the success of the Jackhamer air feed leg depends almost entirely on the use of tungsten carbide bits as the cutting medium, the question of whether to use detachable carbide bits or rods having carbide inserts solid in the end of steel is one which has engaged considerable attention.

A careful survey has indicated that the majority of mining operators in Canada prefer the detachable bit. For reasons of economy, it is desirable to obtain the maximum life of the bit as well as the rod itself. Since most mining properties do their resharpening of bits on surface, close control of bits issued is maintained, each machine operator being charged and made responsible for the number of bits issued daily.

There is a very definite objection to the transporting of integral bit drill rods underground each shift; however, this is frequently the case where sharpening takes place on surface.

Use of detachable bits affords the opportunity of switching from either chisel type to four-point type at the drilling face should the occasion justify such a move to improve drilling results.

Tungsten carbide bits of the detachable type are available in small gauge sizes; i. e., 1⅜ in. either four pt. or chisel type for ⅞ in. hexagon or Q.O. drill steel; or 1½ in. gauge size for ⅞ or 1 in. section of drill steel.

Resharpening takes place as often as necessary and is governed entirely by the nature of the rock in which they are drilling. Experience has proven beyond doubt that proper grinding at the right time constitutes the greatest single factor in the success of the tungsten carbide bits.

Currently there are many designs being tried. Up to the present time, the integral reverse buttress thread type is well accepted and is steadily gaining in favor in the Jackhamer air feed leg set-up.

Obtainable footage from the bits is governed entirely by the ground being drilled and the care and attention they receive during their life.

Drill Rods

At the present time there has been developed a relatively large number of different designs of attachment between the bit and the rod. Some favor the threaded type while others use the design generally known as the push-on connection. A recently designed series of bits uses a modified reverse buttress thread which is turned on the end of rod and is of the shouldering type. This attachment was designed specially for Carset Jackbits, and is currently being used successfully on ⅞-in. hexagon and quarter octagon drill steel with the smallest gauge size bits. It is also available for any section of drill steel up to 1½ in. and bit sizes ranging from 1⅜ to 3-in. gauge diameter. This attachment can be used successfully on straight carbon or high or low carbon alloy drill steel.

Recommended heat treating formulas have been carefully worked out for the annealing before machining and heat treating after machining, and generally if the prescribed procedure is properly followed satisfactory attachment life results.

An important factor in obtaining maximum bar life from the steel itself is to see that when the threaded attachment fails the broken end is cut off and the rod rethreaded—it is conceivable that the attachment end can be replaced two or three times during the life of the bar itself. The opinion of the majority of Canadian operators is that a detachable hard surface bit is more generally acceptable because if any one of the components, such as the bit itself, threaded end of the rod or any other section of the rod fails, the broken components can be replaced. With insert integral with the rod, if failure occurs at the bit end or in the rod itself the whole assembly is lost.

In Canada, detachable bits found a worth-while place during the steel bit era; now, however, we are entering the tungsten carbide area and a recent survey very definitely indicates that for hard rock drilling detachable carbide bits are economically sound. Increasing appreciation of other savings, which effect ultimate cost per unit of production, are proving them economical in softer rock as well.

Report on Performance

Tests have been run in several Canadian mines to investigate further the performance of the air feed leg equipment under actual working conditions with regular crews who have had some instruction by expert demonstrators. Some of these tests follow in detail for observation and comparison.

In order to determine the adaptability of the Jackhamer-Jackleg-carboloy bit combination to various types of drilling required at this mine, tests were run to compare the footage drilled per man-shift with conventional large bore machines and test the flexibility of the machine with respect to drilling performance. In addition it was proposed to ascertain the feasibility of training crews in the use of this equipment.

Tests were made over a period of time under every type of condition generally encountered, with the same drilling crew in every instance.

The first week was spent on development work, two machines being used simultaneously. During this time detailed instructions were continually given to the men in the proper use of the equipment.

Records were kept of the daily footages, over-all time and general performance of the equipment.

Drill's Performance Flexible

Light weight of the equipment affords a flexibility of operations which cannot be matched with standard or conventional drilling machines.

No mounting is required so setting up, tearing down, and shifting the machine on the mounting is eliminated and less physical exertion on the part of the miner is required, hence a better use of his time for drilling.

Air consumption is considerably reduced on these machines, resulting in better air pressures at the machine. Readings taken while drilling was in progress indicated that an improvement of at least five percent in air pressure could be expected at the face.

While testing in development headings, certain advantages of the new machines were quite obvious. In one instance a round was completed in one heading and another round was drilled in another during the same shift. Three separate slashes were taken on one level during a single shift, in three different headings.

Although the drilling crew had little training in this drilling method, it was felt that under the circumstances their output would not have been increased if conventional equipment had been used.

Light weight equipment gives best performance in stope work where there is a high percentage of horizontal hole drilling. In addition to the advantages of using lighter equipment and allowing more drilling time, this rock drill is a dual purpose drilling machine which can be changed in a matter of a few minutes from a mounted to a hand-held machine. It has not proven successful in replacing a conventional stoper type drill for overhead drilling.

Set-ups are either simplified or eliminated altogether, particularly where the back or the wall of a stope is not easily accessible.

The most important phase of this test consisted of training a crew in the proper handling of the unit equipment. Men were able to drill with the Jackleg machines from the start but it soon became apparent that certain aspects would give the average miner some difficulty. The tendency at first is to use brute strength. As time goes on, the men get the feel of the machine and after two or three months

Small space requirements permit following narrow veins; often two drills can work in same narrow heading

the average miner should have complete control over his machine.

Development Tests

The following performance comparisons (Table I) were recently recorded between Jackhamers mounted on air feed legs using small diameter carbide bits and 3½-in. drifters, column mounted, using larger diameter steel bits.

This competitive test indicated superior performance and much higher efficiency for properly mounted drifter drills with comparable diameter carbide bits.

Production Tests Revealing

In a stope 15-20 ft wide with porphyritic rock, containing about 12 percent quartz in irregular stringers, rated as medium hard to hard drilling, a test was carried out using two Jackhamer machines and two operators then one Leyner with a runner and a helper operating in the same working place, but on another breast. Both outfits had similar conditions; i. e., horizontal holes on breast work with the Leyner on vertical column bar and arm. (Table II.)

The Jackhamer-Jackleg operators finished early and if there had been another face to drill, additional holes could have been drilled. By using two unit machines, one for each miner, more holes could be drilled in a shift producing a higher average tonnage per man-shift with a major saving in the cost per ton broken.

As a result of these tests it was found that Jackhamer-Jackleg equipment could be operated successfully in a stope on horizontal drilling with considerable savings in labor, compressed air and time. Contributing to this conclusion were the observations that set-up time and bull-work was at a minimum, and the machine can be operated by one miner easily, eliminating a helper.

Many more tests have been carried out in the field with the unit equipment with similar results. The equipment is applicable to many working places and can lower the cost of rock drilling in such places. It may be applied to quarries and construction work where conditions are suitable.

Work such as this in Canadian mines has shown that the introduction and development of this particular combination has made available a system of drilling with possibilities of reduced mining costs, where applicable, and also reduced physical effort in underground rock breaking.

It is not believed that it will replace stoper type drills in steep raise work.

The relative future role of the air leg drill combination in tunnel work in Canada cannot yet be evaluated. Medium or light weight drifter drills with small diameter carbide bits might continue to dominate this field.

In general, it can be stated that the results of these tests indicate that mine operators and miners alike are concluding that there is now available a combination of drill mounting and bit which will readily find an ever-increasing range of application in stoping, sub-drifting, slashing, quarries and construction work.

Table I

	Jackhamer and Jackleg		Two 3½-in. Leyners			
	Hrs.	Mins.	Hrs.	Mins.	Hrs.	Mins.
Set up	0	10	0	40	0	40
Aligning and collaring holes	0	20	0	09	0	11
Changing steel	0	39	1	12	0	55
Drilling time	4	31	2	25	2	23
Lunch	0	39	0	27	0	28
Tear down	0	07	0	14	0	14
Delays	0	28	0	17	0	12
Total time	6	54	5	24	5	03
Number holes drilled	27		14		14	
Holes lost						
Length of steel	7′ 7″		7′ 7″		7′ 7″	
Footage drilled	206′ 1″		108′ 1″		108′ 4″	
Rate of penetration	8.1″/min.		8.9″/min.		9.1″/min.	
Air consumption	95 cfm		185 cfm		185 cfm	
Drilling time/working time	72 percent		49 percent		52 percent	

NOTE: Drilling time is time actually cutting rock. Working time is time actually at the face and does not include lunch period. On a similar test using 3½-in. drifters, long feeds mounted on boom type jumbo and small diameter carbide bits the average drilling speed was 12 in. per minute over-all—or approximately 3 to 1 as compared to Jackhamer air feed leg combination.

Table II

Operation	Jackhamer-Jackleg 1		Jackhamer-Jackleg 2		Leyner 1	
	Hrs.	Mins.	Hrs.	Mins.	Hrs.	Mins.
Set up	0	12	0	12	0	43
Scaling	0	54	0	54	0	51
Staging	0	18	0	9		
Collaring and lining holes	0	6	0	7	0	19
Changing steel	0	15	0	16	0	38
Drilling	2	7	2	6	3	6
Delays	0	19	0	20	0	38
Tear down	0	8	0	10	0	7
Lunch	0	40	0	40	0	41
Total time	4	59	4	54	7	33
Number of holes	7		8		12	
Footage drilled	105′ 2″		119′ 6″		127′ 3″	

To Develop Iron Ore Deposits

BETHLEHEM Steel Co. has begun work on two iron ore properties, one in this country and one in Canada, which will soon be producing ore for the nation's ever expanding iron and steel demands.

A shaft which may reach a depth of more than 2500 ft has been started near Morgantown, Pa. The shaft, being sunk by the Frazier-Davis Construction Co. of St. Louis, will have three compartments. Two will be used for skip hoisting and the third for transporting men and supplies.

It is estimated that full production will be attained within two-three years and that 1250 men will be required for the daily working force.

At the same time Marmoraton Co., a subsidiary of Bethlehem, has started preliminary work of clearing timber and brush in preparation for mining an iron ore deposit in eastern Ontario. The property to be developed is at Marmora, 30 miles north of Trenton, Ont., and 100 miles east of Toronto.

Ore is covered by a 150-ft limestone cap removal of which will require about two years. When the pit is put into operation, ore will be hoisted up an incline, crushed, ground and concentrated. The operation is expected to produce 400,000 tons of concentrate a year.

Engineers estimate that about 10,000,000 cu yd of capping will have to be removed before mining begins. Ore in place is reported to contain about 40 percent iron and it is planned to increase this to 60 percent in the concentrating process.

Hewitt-Robins Conveyor Belting Lasts Longer Because It's Matched to the Load

Over the years, belt conveyor operators have found it's false economy to "cut corners" on their belting. The best belting they can buy has always proved *the best buy* . . . in extra months or years of service, freedom from repairs and ease of maintenance.

And what's "best" for one materials handling job isn't always best for another. That's why we make three types of belting: Maltese Cross® for the hardest, toughest jobs; Ajax® for general service, and Conservo® for lighter applications and portable conveyors.

Each is matched to the load it will carry. Ajax Underground Belting, for example, is designed for heavy-duty, around-the-clock underground coal mine service. Because it's built to take the hardest kind of punishment, it means bigger tonnage nauls at less cost.

There's a Hewitt-Robins conveyor belt for every bulk materials handling assignment, below and above ground. For the best buys in belting, call your Hewitt Rubber distributor (listed under "Rubber Products" in the classified phone book), or write Hewitt Rubber Division, 240 Kensington Avenue, Buffalo 5, N. Y.

EVERYTHING YOU WANT IN CONVEYOR BELTING!

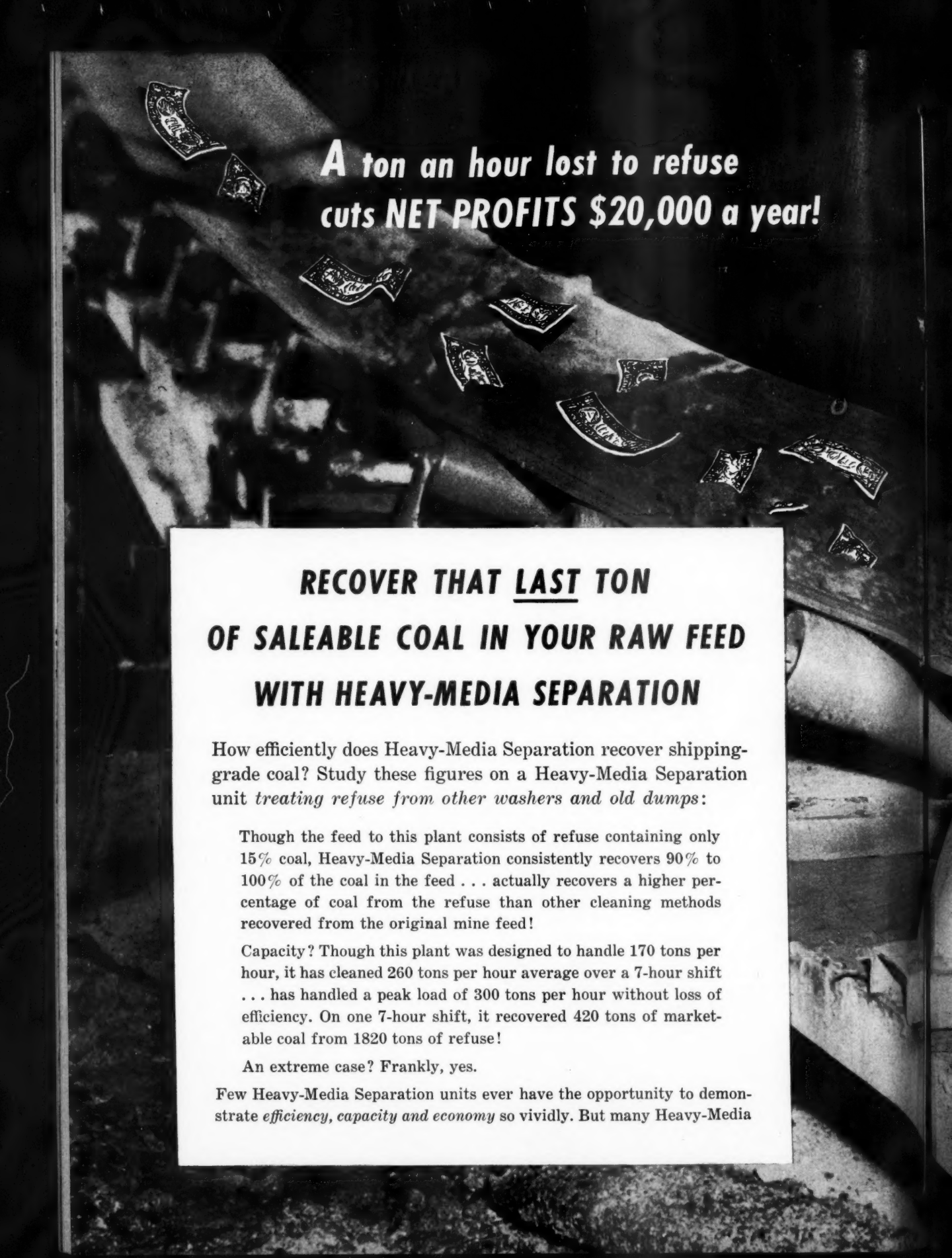
- **Hewitt-Robins belting is especially treated to resist the destructive action of moisture and mildew. High-grade frictions and liberal skim coat insure against ply-separation.**
- **Abrasion-resistant covers are made of extra tough rubber. Rigid-edge construction prevents curling . . . insures true troughing.**
- **Heavy textile reinforcement provides great strength with high flexibility.**
- **Dollar for dollar, you can't buy *longer belt life* anywhere!**

HEWITT-ROBINS

CONVEYOR BELTING

HEWITT-ROBINS HR **INCORPORATED**

BELT CONVEYORS (*belting and machinery*) • BELT AND BUCKET ELEVATORS • CAR SHAKEOUTS • DEWATERIZERS • FEEDERS • FOAM RUBBER PRODUCTS • FOUNDRY SHAKEOUTS • INDUSTRIAL HOSE • MINE CONVEYORS • MOLDED RUBBER GOODS • RUBBERLOKT ROTARY WIRE BRUSHES • SCREEN CLOTH • SKIP HOISTS • STACKERS • TRANSMISSION BELTING • VIBRATING CONVEYORS, FEEDERS AND SCREENS



RECOVER THAT LAST TON OF SALEABLE COAL IN YOUR RAW FEED WITH HEAVY-MEDIA SEPARATION

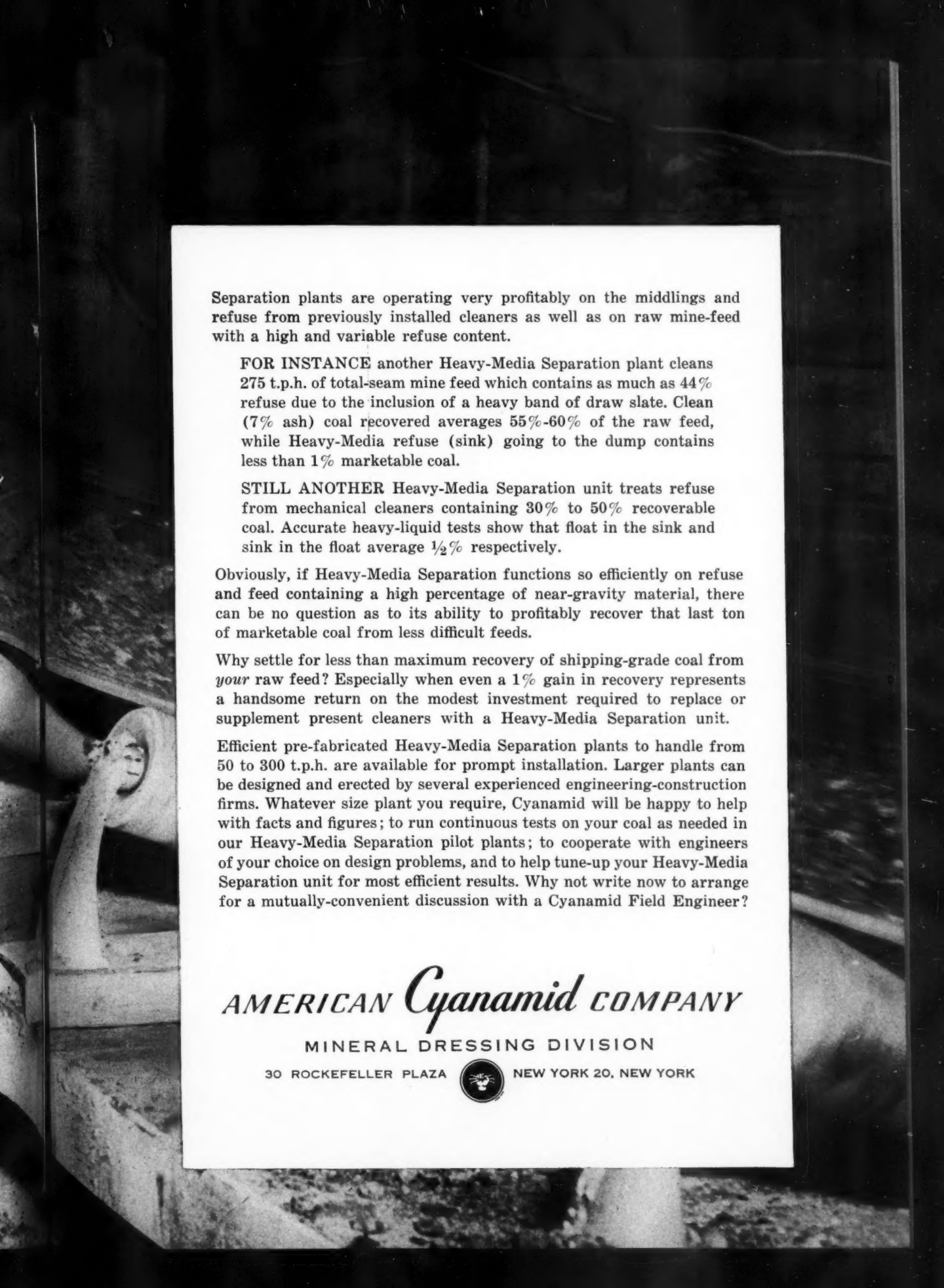
How efficiently does Heavy-Media Separation recover shipping-grade coal? Study these figures on a Heavy-Media Separation unit *treating refuse from other washers and old dumps*:

Though the feed to this plant consists of refuse containing only 15% coal, Heavy-Media Separation consistently recovers 90% to 100% of the coal in the feed . . . actually recovers a higher percentage of coal from the refuse than other cleaning methods recovered from the original mine feed!

Capacity? Though this plant was designed to handle 170 tons per hour, it has cleaned 260 tons per hour average over a 7-hour shift . . . has handled a peak load of 300 tons per hour without loss of efficiency. On one 7-hour shift, it recovered 420 tons of marketable coal from 1820 tons of refuse!

An extreme case? Frankly, yes.

Few Heavy-Media Separation units ever have the opportunity to demonstrate *efficiency, capacity and economy* so vividly. But many Heavy-Media



Separation plants are operating very profitably on the middlings and refuse from previously installed cleaners as well as on raw mine-feed with a high and variable refuse content.

FOR INSTANCE another Heavy-Media Separation plant cleans 275 t.p.h. of total-seam mine feed which contains as much as 44% refuse due to the inclusion of a heavy band of draw slate. Clean (7% ash) coal recovered averages 55%-60% of the raw feed, while Heavy-Media refuse (sink) going to the dump contains less than 1% marketable coal.

STILL ANOTHER Heavy-Media Separation unit treats refuse from mechanical cleaners containing 30% to 50% recoverable coal. Accurate heavy-liquid tests show that float in the sink and sink in the float average ½% respectively.

Obviously, if Heavy-Media Separation functions so efficiently on refuse and feed containing a high percentage of near-gravity material, there can be no question as to its ability to profitably recover that last ton of marketable coal from less difficult feeds.

Why settle for less than maximum recovery of shipping-grade coal from *your* raw feed? Especially when even a 1% gain in recovery represents a handsome return on the modest investment required to replace or supplement present cleaners with a Heavy-Media Separation unit.

Efficient pre-fabricated Heavy-Media Separation plants to handle from 50 to 300 t.p.h. are available for prompt installation. Larger plants can be designed and erected by several experienced engineering-construction firms. Whatever size plant you require, Cyanamid will be happy to help with facts and figures; to run continuous tests on your coal as needed in our Heavy-Media Separation pilot plants; to cooperate with engineers of your choice on design problems, and to help tune-up your Heavy-Media Separation unit for most efficient results. Why not write now to arrange for a mutually-convenient discussion with a Cyanamid Field Engineer?

AMERICAN Cyanamid COMPANY

MINERAL DRESSING DIVISION

30 ROCKEFELLER PLAZA NEW YORK 20, NEW YORK

piping repairs *cost more* now!

You make them less often by using Dependable Quality

CRANE VALVES

...That's why more Crane Valves are used than any other make

No. 488 Iron Body Clamp Gate

easy access prevents trouble with this valve

Remove just two nuts to dismantle this gate valve for inspection, cleaning, or repairs—without taking it from the line. Reassemble just as easily, knowing that Crane clamp design keeps the bonnet joint snug and accurately aligned. Use Crane Clamp Gates on steam, water, and air, but especially in heavy fluid lines needing periodic cleanout. They'll save time, labor, and encourage regular servicing that prevents valve trouble.

Combining easy access with highly dependable service features, Crane Clamp Gates typify Crane Quality—*better valve performance at lowest ultimate cost.*

CRANE

CRANE CO., *General Offices:*
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

ALWAYS OUT FRONT WITH

Long-Life Service

The impressive service records of Bucyrus-Erie stripping shovels and draglines mean shift-after-shift, year-after-year performance in moving millions of yards of overburden at economical cost. These records amply prove the superiority of Bucyrus-Erie "years ahead" design and the top quality of Bucyrus-Erie craftsmanship — backed by the most extensive field experience of any excavator manufacturer. Bucyrus-Erie stripping shovels and draglines are available in capacities from 2½ to 36 cubic yards to fit any open-pit mine requirement.

135L51

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

Electric Power in Coal Mining

These three papers, presented before a joint meeting of the New River and Winding Gulf Electrical and Mechanical Institute and the Charleston Chapter of AIEE, highlight the close tie between advances in coal mining and the electric power industry.

The Relationship of Electric Power To Coal Mining

By C. C. DARRAH,
Assistant District Manager
Appalachian Electric Power Co.

ONE of the most interesting features of the present day is the rapid development of the coal mining and electric power producing industries during the past seventy years. Tremendous strides have been made during this period in production and in use of the products, coal and electricity. On every side are evidences of this rapid technological development resulting in vast increases in the uses of coal and electricity.

These two products are closely related and are dependable sources of energy. That the public is becoming aware of this fact is shown by the following newspaper article:

"The partnership between coal and electricity is one that means much to the residents of this area, dependent as they are on the economics of coal.

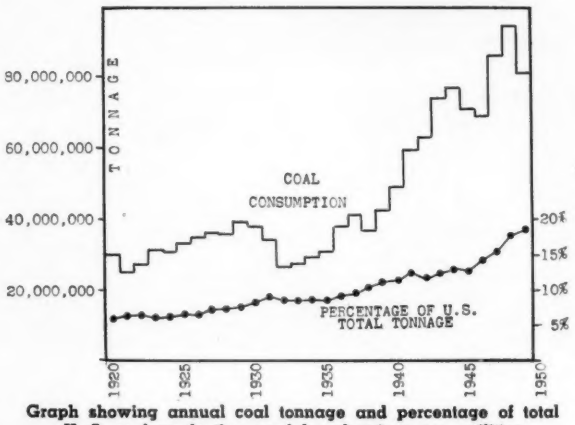
"Most of us realize the importance of electricity to mining. It has literally lifted the industry out of the horse and buggy days by bringing faster, safer and better techniques into the mines.

"On the home front it has brought comfort and luxury to the individual miner and his family with electric ranges, refrigerators and lights with which to read their evening paper.

"What we fail to realize is that today the electrical utility business is the largest consumer of coal."

In the early days of the electric industry there was no transmission of power and power plants were small, scattered, direct current and close to their load centers. Coal operators had very little machinery and depended mostly upon the hand pick, shovel and the mule. To replace the mule they first had small d-c power plants and then rotary converters and MG sets. Later came the rectifiers and now, a-c systems. Power companies discovered the advantages of high tension power transmission and throughout the years have combined their facilities and resources to build the present large inter-connected systems now in existence. Since 1914 coal production has doubled and the use of electricity has increased twenty times. Also, during this time, the cost of electricity has been materially reduced and the miner who used to produce an average of four tons in 8 hours now produces six tons of coal in a 7 hr shift.

" Jenny" was good for about 750 watts



Graph showing annual coal tonnage and percentage of total U. S. coal production used by electric power utilities

In the development of modern mining over the past generation, electric power has replaced the mule. He was a good mule. Good for about 750 watts, he could exert enough force to burn thirty 25-watt lamps simultaneously or with electricity at one cent per kwh could work continuously for one and one-third hours to produce a single penny's worth of power. How many mules has the Appalachian Electric Power Co. replaced in the mining industry? This question is not easily answered but a conservative estimate is 600,000 mules in the West Virginia area alone.

Home Energy Demands Greater

An entirely new development is the "heat pump." Most people are familiar with the household refrigerator, a heat pump which transfers heat from the inside of the box to the outside, thereby cooling the former. In any of its forms a heat pump utilizes this principle and is simply a means whereby heat is moved from one place to another.

Several of these heat pumps have been installed in resi-

dences throughout the country recently and it is believed its principle will be widely employed for house heating and cooling in the years to come. The Power Company can and will actually pump energy from the coal seam into the home. But this is only one home service; each year we see more and more household tasks being performed by electricity—cooking, sweeping, dishwashing, garbage disposal, laundering, to say nothing of fans and ventilators. These all add up to a substantial power demand.

Electric power utilities are continually increasing their consumption of coal, as is shown by the accompanying chart, and at the same time are taking a greater percentage of total coal production. In 1899 they used six percent of all coal produced in the United States; in 1949 their use had increased to 18 percent—84,000,000 tons. The electric industry is the largest consumer of coal and coal constitutes its greatest source of power—furnishing more than two-thirds of the fuel used generating electricity in 1949.

Tieing these facts together it is readily seen that the relationship between the electric power industry and the coal mining industry will continue to grow.

Coal Produces Electricity

Four major steam plants in the Appalachian Electric Power Co. area have an aggregate capacity of 867,000 kw and are currently burning approximately 2,897,000 tons of coal annually. These plants are being expanded and ultimately may have a capacity of 2,467,000 kw. If and when this capacity is reached, the amount of coal burned annually will be approximately 7,177,000 tons, or enough to fill a train of 143,800 railroad cars 950 miles long. At a production rate of six tons per man-day this would result in the employment of 4790 miners, five days a week and 50 weeks a year.

For safe and efficient service the vast network of transmission lines are utilizing the latest methods of lightning and other fault protection. Now in service are high speed reclosing oil circuit breakers at the ends of each section of line which will automatically open and reclose in a total elapsed time of 18-20 seconds or one-fifth of a second, resulting in not much more than a slight flicker to the lights served from this system. These oil circuit breakers are controlled by carrier current actuated relays which automatically control the functioning of all of these oil circuit breakers throughout the system.

We are busily engaged in research work to improve our systems. Unfortunately we do not have the money for the same high degree of protection on low voltage distribution lines but hope to install comparable protection in the years to come.

Power Requirements for the Continuous Miner

By FRANK R. HUGUS,
Electrical Engineer,
Joy Manufacturing Co.

WHEN discussing continuous mining it should be remembered that this is a system, not a machine. At the face, of course, coal is produced by a machine which has been designated a continuous miner, but this is a misnomer unless the unit is supported by proper coal removal as well as an adequate power supply. Another important point is that continuous machines and associated equipment demand horsepower, not torque, for proper operation. Horsepower is the product of speed and torque and the speed of a motor is directly proportional to the voltage applied, while torque is directly proportional to the current flowing through a motor. Therefore, to secure horsepower, both voltage and current of the proper value must be applied to a motor. If torque only is required, such as in traction motors or cutting machine motors, a good supply

Continuous mining is a system, not a machine, and must include proper coal removal and adequate power supply

of current is necessary but voltage often is considered of secondary importance.

Constant Voltage Needed

It has been acknowledged that many coal mines have erratic voltage. Many times it drops as low as 150 v. This condition could be lived with in the past because of the nature of mining systems in use and a drop in voltage merely meant that the motors driving a machine would slow down. However, in continuous mining system, such a slowing down cannot be tolerated. In the first place, the coal breaking head tends to require more power at slower speeds and, secondly, if the coal conveying device between the miner and the main line haulage system slows down, there will be an undesirable piling up of coal. A voltage which will not drop below 225 v at the machine is necessary for proper continuous mining.

One of the major electrical handicaps under which d-c mines work today is the fact that a grounded return line is in common use. Undoubtedly the relationship of this system to the over-all production of coal is satisfactory; otherwise, a greater use of insulated positive and negative power systems would have come into existence. However, an electrical engineer considering the effects of electrolysis, sneak currents, high resistance return circuits with resultant poor voltage at the machine, and danger, can feel justified in recommending a completely insulated negative as well as positive line. Much of the controversy and discussion revolving around the question of grounding would never have come into being if coal mines had always used the insulated return instead of the grounded return wire.

AC Has Many Advantages

Alternating current has many advantages to offer to mining—especially continuous mining. The very nature of a-c motors is such that they will stall when overloaded rather than slow down. This means that when they operate they are producing horsepower and not just torque. This horsepower is produced at the proper speed and the coal is removed from the face and conveyed to the main line haulage at a consistent, uniform rate. Tests and observations of the few a-c continuous miners in service at present indicate that these machines require less power than dc machines.

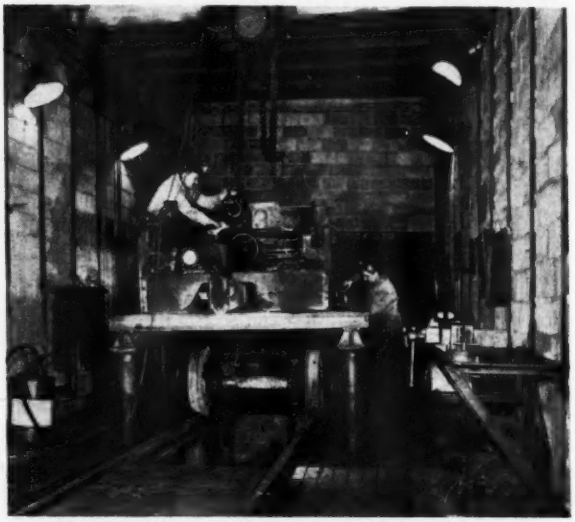
Alternating current systems usually have each phase

wire insulated from ground. This contributes to the general safety of personnel and property. Even if 440 v is used between each phase wire, the voltage from phase wire to ground will only be 440 divided by $\sqrt{3}$ or 257 v if a grounded "Y" system is used. Also, there are available today several excellent protective devices that utilize the inherent characteristics of alternating current to provide a very high degree of protection from shock hazard.

Since the trend in mining is toward the use of higher powered machines, it is becoming increasingly evident that power under 330 v is inadequate because of excessive voltage drop. The use of higher voltage alternating current will improve mining conditions. However, certain state regulations must be revised if the use of higher a-c voltages is to become general practice in mines.

Power Needed

Consider the connected horsepower and average load, or as it is more accurately expressed in electrical terms, the root mean square load, of continuous miners and related equipment. Naturally, the rms load is dependent upon many factors. The figures used therefor have been chosen



Men responsible for servicing the machines play a more vital role in a continuous mining system

from some of the better installations observed in the past. The Joy Continuous Miner has a connected load of 163 hp. It has been observed that this machine will require from 90 to 130 hp when it is operated without any delays due to external causes. Since the tests from which these figures were derived were taken when these machines were used in conjunction with conventional mining machines and systems and thereby slowed by external causes, I believe we can safely use the figure of 125 hp as the average power required by a properly operating continuous miner. This should result in an output of 500 tons per shift.

Many continuous miners at present discharge into shuttle cars. Most of these shuttle cars have a connected load of 38 hp, although some of them may have a connected load of only 30 hp. Tests indicate that the rms horsepower on an eight-hour basis for two shuttle cars is 30 hp.

If portable belt conveyors are used behind a continuous miner, the connected load, as well as the rms load, will vary with the number of conveyors necessary to extend between the continuous miner and the discharge point of the outby conveyor. Each conveyor is equipped with one motor rated at 1½ hp and the rms is 1½. Therefore, the portable belt conveyor load will vary between 1½ hp, if one conveyor is used, to 22½ hp, if 15 conveyors are used.

The extensible belt conveyor is such a new machine that it is not possible to state the rms load based on actual tests. However, the extensible belt conveyor does have a connected load of 35 hp of which it is expected that not more than 12 hp will be required for the rms load.

Other Factors Included

Thus, with one continuous miner and two shuttle cars, the rms horsepower can be 155; with one continuous miner and 15 portable conveyors, the rms horsepower can be 147½; with one continuous miner and one extensible belt conveyor extended 300 ft, the rms horsepower may be 137. To these figures, of course, must be added the power required by ventilation, the high pressure pump for the spray nozzles, and other auxiliary equipment loads. A new type of electrical load not previously considered in the United States—flood lighting at the face—is now being studied by some progressive individuals.

A complete picture of continuous miner power requirements cannot be presented unless the matter of maintenance and repairs is considered. Certainly, if the continuous miner system is not able to work because of a breakdown, no power will be required. Therefore, the man responsible for supplying power to the continuous mining system and the men servicing the machines play a more vital role in a continuous mining system than they play in the conventional mining system. Continuous mining requires that a smaller number of machines be kept in continuous operation to produce a satisfactory amount of coal.

Six Years Experience with Operation Maintenance of Mercury Arc Rectifiers

By JOHN A. DUNN,
Electrical Engineer,
Island Creek Coal Co.

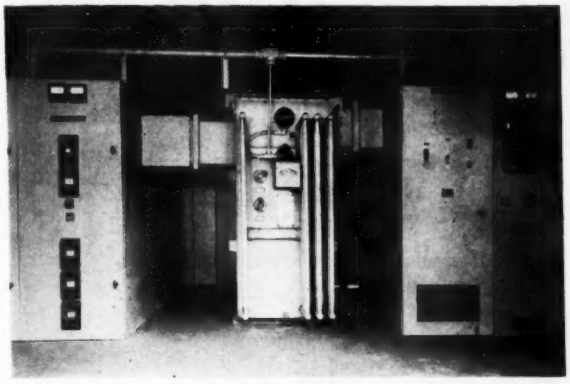
THE author's experience is based on the operation of 14 stationary mine type ignition rectifiers; half General Electric and half Westinghouse. Seven of the units have been in service an average of six years and the other seven have been in service an average of four years. All of the rectifiers are stationary type with the incoming a-c side arranged for 6900/7590/12000Y/13150Y to 275 volts d-c. They are for operation on a 6900 volt delta, 12540Y or 13200 volt delta system. On the d-c side they were equipped with one standard automatic reclosing breaker, stub-multiple feed. The first four units went into service negative grounded, these were changed to positive grounded after about nine months operation and the rest of the units were installed positive grounded. Although there have been few ill effects from operating positive grounded, there are enough arguments for operating negative grounded to suggest that any new systems should be so installed.

Units were first installed with the water to air temperature regulator grounded and an insulated section in the rectifier water piping. This did not work well because of the restrictions in the use of rust inhibitors and to some extent anti-freeze solutions. So much trouble was experienced with electrolysis in the water system that out of desperation it was decided to change to positive grounded. Even this was not the final answer to water system troubles until it was found that the temperature regulator had to be connected to the cathode bus with a piece of copper wire. Early units were not arranged so that the temperature regulator could be easily insulated from ground so it was preferred to operate them at ground potential. Experience leads to the recommendation that the entire water system should be operated at cathode potential. Water should be as clean and non-corrosive as practical. Excellent results have been obtained with dis-

tilled water in which a small amount of sodium chromate and borax was used. For anti-freeze methol alcohol is added.

Two ruptures in the water system caused damage to rectifiers. One was a sand hole in a brass ell which allowed it to break. Water was sprayed over part of firing circuit auxiliaries and caused these to fail electrically. The other rupture was in the jacket of a tube through inner and outer walls of which, on short circuit, holes were burned. Besides losing the tube, a small dry plat rectifier and two small resistors were also lost.

In order to give some indication of faults that might cause outages nearly all our outages will be accounted for



Seven of the ignitron rectifiers in service at Island Creek Coal Co. are of this 300 kw stationary type

with causes. Some early records are not very reliable and it is possible that some may not be included.

Four outages were caused by poor contact on auxiliary relay for high voltage breaker; two by failure of saturating reactor in firing circuit.

Three were caused when the high voltage breaker latching mechanism bounced, unlatching the breaker. Eight were the result of water pump bearing failure. Three outages were caused by high pivot friction in d-c load measuring relay. Two were outages caused when the secondary bus in a power transformer bent and welded itself to the core clamp iron under short circuit.

Friction in the high voltage breaker latch which resulted in improper resetting caused five of the outages and 17 were the result of tube failures.

Of the 44 listed about 14 would never have occurred if the outage had been properly analyzed and corrective repairs were made by maintenance men.

Unbalance Caused by Low Voltage

In the fourteen rectifiers 102 ignitron tubes have been used; 17 have failed and one was returned after testing as suitable for service. Of the 17 failures, eight lasted over 36 months, average life of 53 months. Nine failed in from one to 24 months for an average life of 13⅓ months. There are now six tubes that have been in service over 60 months, and four have been in service 77 months. These figures do not include several tubes that failed due to poor circulation of coolant caused by sludging of cooling system while operating grounded negative.

During the time of operating grounded negative a great deal of sludging and deteriorating on pipe fittings was noticed. Most deteriorations seemed to occur at the fittings on the water pump and pump impeller. After the change to grounded positive the water systems were so clogged up and piping so unreliable that the four units were completely repiped.

Troubles would be few and far between if the water system was perfect. That is, if the piping was free from defects and leaks and the pump was trouble free. The best experience has been with copper pipe and soldered connections and with the vertical, sump-tank mounted pump. Good results have been attained with the use of hose connections between rectifier and temperature regulator. Hose connections on the tubes seem to be holding up well although they may give trouble if not given proper attention. It is believed that copper tubing with flare type fittings would give good results.

Service from the ignitron rectifiers has been satisfactory, and it is felt that many of the troubles experienced could have been avoided. For mining service it is recommended that the closed cooling system be used with water to air temperature regulator; that the temperature regulator be operated at cathode potential; and pure water with rust inhibitor as recommended by the manufacturer should be used. Also, it is strongly recommended that maintenance and service personnel be well qualified. It is felt that some of the troubles and outages which have occurred were caused by inexperienced maintenance personnel.

Coal for Electric Power

INCREASE in electric power output is being matched by a large increase in coal tonnage in electric power generation and coal is heading for a new all-time high. An analysis, by the Bituminous Coal Institute, of Federal Power Commission figures dealing with production of electric energy for public use reveals that, while the electric power output in the first four months of 1951 was 16 percent ahead of the corresponding period last year, coal consumption in this power output was 24 percent ahead of the comparable 1950 figures.

The coal consumed during January through April of this year was 35,122,000 tons, as contrasted with 28,265,000 in the same period a year ago. At the present rate, BCI said, electric utility coal consumption for the year will pass the 100 million ton mark. The previous high was in 1948 when bituminous coal consumed by the utilities amounted to 95,620,000 tons, plus 3,847,000 tons of anthracite.

There has been a sharp falling off on the consumption of oil by the electric utilities, so far this year, despite the rise in electric power output. In the first four months, the consumption of oil, measured in terms of coal equivalent, amounted to 5,358,000 tons, hardly one-seventh as much as the coal that was consumed. The figure for oil in the corresponding period a year ago was 6,828,000 tons, in coal equivalent.

The consumption of gas in electric power generation showed a small increase, as compared with last year. Electric energy generated by waterpower, from January through April, was also ahead of 1950.

Total electric power output for the four-month period amounted to 119,851 million kwh, compared with 103,575 million kwh in the same period last year. Coal, oil, and gas, together, accounted for 84,533 million kwh and, of these three, coal's share was more than twice as much as the other two combined, the Bituminous Coal Institute pointed out.

The BCI analysis concluded with the statement that, while the electric utilities are using more coal than ever before in the electric power generation, they are getting more kilowatt hours per ton than ever before, thanks to the combined efforts of the engineers of both industries to obtain higher efficiencies in coal utilization. This has been achieved through a better preparation of the coal, coupled with significant improvements in boiler room techniques. As a result, one pound of coal in electric power generation goes as far as three pounds did thirty years ago.

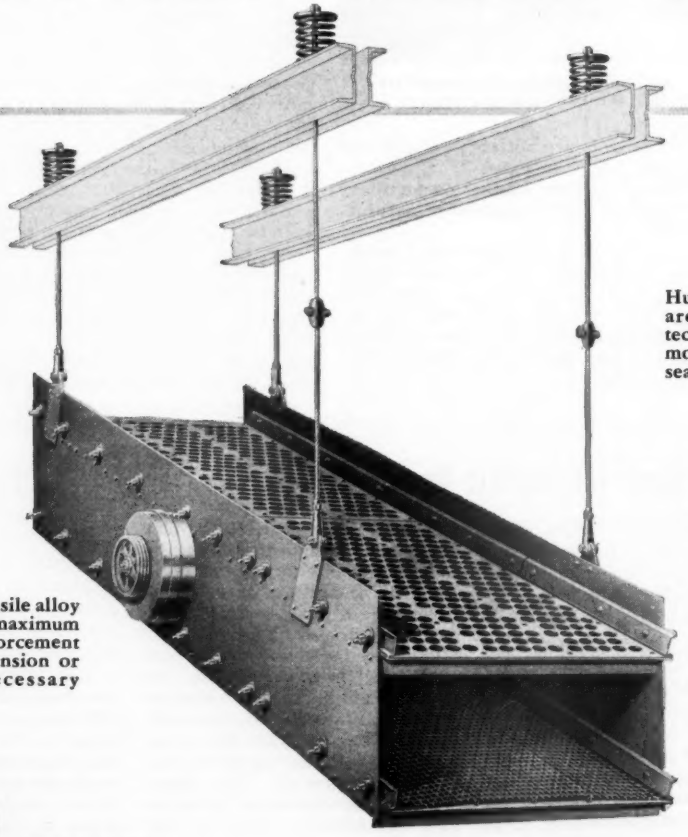
For accurate sizing...
For thorough rinsing...
For rapid dewatering...

the BETTER WAY is with CA

Concentric Action Vibrating Screens

No matter what your screening requirements — Link-Belt CA Vibrating Screens offer top efficiency. Self-aligning vibrator mechanism imparts a smooth, positive, circular motion to every square inch of every deck. Lively tumbling action gives each particle maximum opportunity for sizing, washing or drainage.

There's a standard size CA for almost every job — 3 x 8 to 6 x 16 ft. . . . single, double and triple deck . . . suspension or support mounted. Remember, when it comes to materials handling, profit-wise operators come to Link-Belt.



Two-bearing vibrator has constant bearing loads — no shock from impact of feed.

Unbalanced weights easily adjusted to amplitude of highest efficiency.

Screen box of high tensile alloy steel plate provides maximum strength. Solid reinforcement at vibrator and suspension or support insures necessary rigidity.

Husky roller bearings are completely protected from dust and moisture by labyrinth seals, steel housing.

Centrifugally-actuated, unbalanced weights eliminate excessive vibration in accelerating and decelerating.

Screen cloth is securely tensioned and clamped over rubber supports, can be quickly changed.

WRITE FOR BOOK 2354 for complete layout data

LINK-BELT

VIBRATING SCREENS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minnespolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa.) Offices in Principal cities. 12.425

GEOCHEMISTRY—A Symposium On The Prospector's Newest Tool

Part I of this important discussion of mining's newest means of ore finding is presented below. In Part II Owen Kingman and George M. Fowler will relate how geochemical methods were applied in Tennessee and the Mississippi Valley.

By
H. E. HAWKES
RAY E. GILBERT
T. S. LOVERING

WHAT GEOCHEMISTRY IS AND WHAT IT CAN DO*

By H. E. HAWKES,
Geologist
U. S. Geological Survey
Denver, Colo.

IN war or peace, modern industrial society needs increasing supplies of nonferrous metals. Except in emergencies, this country has been blessed with ample blocked-out or probable reserves of base metals. The bulk of current production comes from deposits discovered at outcrop by prospectors 50 years or more ago. Despite deposits of considerable economic importance found within the last generation, the lag between discovery and production is increasing in most districts.

Many large bodies of ore near the surface have probably escaped discovery because of a capping of soil or barren rock. Serious attention is being directed to techniques of locating ore that does not crop out.

Geochemical methods offer a promising means of locating concealed ores. With interest focused sharply on long-range mineral supply, let us review what geochemistry offers as a prospecting tool.

Geochemical prospecting is the search for chemical halos or "anomalies" in surface material that may point the way to sub-surface mineral deposits. Such chemical indications of ore may extend far above the limits of the ore and any other visual indication of mineralization. The invisible chemical pattern related to a concealed ore deposit may be brought out by chemical tests of surface material.

Locating bedrock gold ore by panning stream gravels and residual soil and studying alteration halos around ore deposits are well-known applications of the same principles. The new feature is the application of chemical tests, rather than the mineralogic or other visual determinations, to map the chemical patterns related to metalliferous deposits.

Simple Chemical Tests are Basic

Analytical techniques that make geochemical prospecting possible are modifications of well-known procedures of trace-metal analyses of soils and vegetation developed by investigators seeking to determine the nutrient effects of minute amounts of certain elements. In most agricultural problems speed and economy of analysis are of secondary importance but the emphasis is reversed in prospecting. Extreme accuracy is rarely necessary, and can be sacrificed for speed and economy.

To be suitable for prospecting, a chemical test should be sensitive enough to detect significant variations in the metal content of samples of natural materials associated with buried ore deposits, even if they contain only "background" concentrations of the element sought.

Speed is exceedingly important as maximum effectiveness depends on prompt follow up of promising indications by more closely spaced samples to pinpoint geochemical anomalies.

Results of analyses are required by the sampler before he leaves the area. The time lag between sample collec-

Soil samples are collected with screen type auger at shallow depth

Samples of new growth are taken as guide to possible ore near the surface

*Published by permission of the Director, U. S. Geological Survey.

tion and receipt of the analytical report should be only a day or two. Part of this problem can be solved by efficient organization. The problem is simplified if analytical facilities can be carried into the field—if not in a knapsack, at least in a light truck.

Economy of analytical work is a must. Large numbers of samples are required and few areas can be adequately appraised with less than 500 samples, and some surveys have involved as many as 12,000. The stint set for the rapid tests developed by the U. S. Geological Survey has been a minimum of 30 samples per man-day, by methods that can be handled by relatively inexpensive personnel. Thus the cost per sample can be kept below 75 cents, including equipment and reagents.

In most prospecting problems the accuracy required is not great. The ratio of the metal content in a significant geochemical anomaly in rocks, soils and vegetation and the local background is commonly at least three to one, and may be as much as twenty to one. Thus, a test accurate to plus or minus 100 percent will usually not miss the anomaly if enough samples are taken. To provide an adequate margin of safety, an accuracy of plus or minus 30 percent is attempted in the short-cut colorimetric tests being developed by the Geological Survey.

TABLE I

	Abundance in average igneous rock	Sensitivity spectrographic analysis of rocks and minerals	Sensitivity colorimetric field test for soils
Zn	132	100	10
Cu	70	50	10
Ni	80	1	10
Co	23	10	10
Mo	2.5–15	10	1

All values are in parts per million.

The sensitivity requirement is met by spectrographic and colorimetric analysis. The relative sensitivity of these methods with some of the key elements is indicated in Table I.

The sensitivity needed in prospecting is suggested by the values for the composition of average igneous rocks, which approximates the composition of average soils.

Spectrographic Analysis

Spectrographic analysis has been used with considerable success. In Sweden, field sampling parties serviced by spectrographic facilities in a central laboratory turned out a large volume of analyses promptly. One crew of four, working on samples of vegetation, could process between 200 and 400 samples per day, including ashing, arcing, estimating the lines, and preparing analytical reports. Soviet physicists have developed spectrographic equipment suitable for soil analysis under laboratory or field conditions. Daily productivity is about several hundred samples per crew. The principal limitations of spectrographic methods in prospecting are the cost and bulkiness of the equipment, the lack of adequate sensitivity for some critical elements, and the need for a skilled operator.

Colorimetric Tests

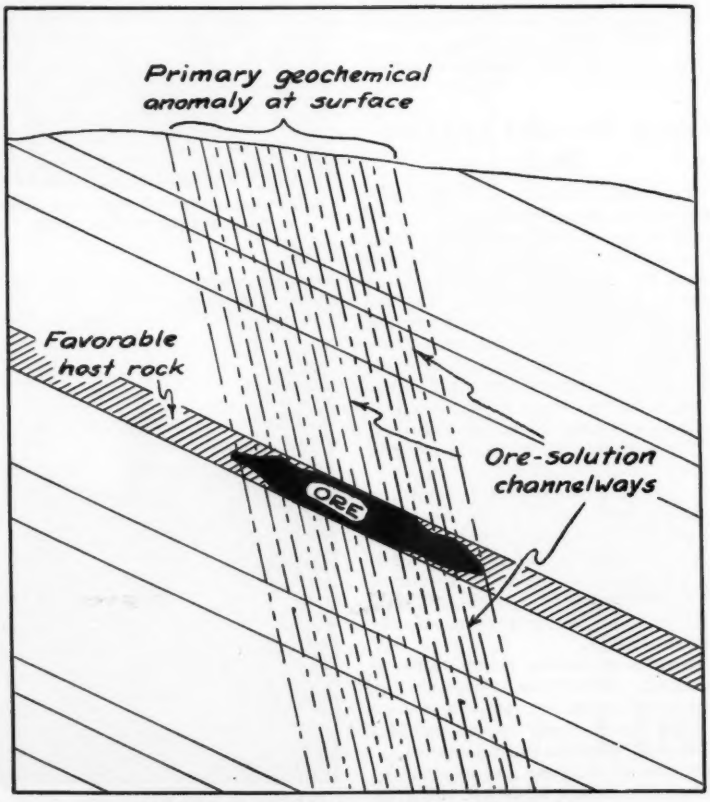
Colorimetric techniques enable determination of minute quantities of an element by the measurement of the intensity of color of a suitable reagent when it reacts with the element sought. The intensity of color is then proportional to the quantity of the element present. The main limitation of colorimetric methods is that only one element or group of elements can be determined at a time.

Rapid colorimetric tests suitable for prospecting work have been developed for zinc, copper, nickel, cobalt, molybdenum, silver, tungsten and the heavy-metal group (undifferentiated zinc, copper, lead, nickel, cobalt, and some rare metals) in soils, for the heavy-metal group in water, and for zinc and nickel in vegetation. Tests are being developed for antimony and arsenic in soils and nickel and silenium in vegetation. Eventually work will be undertaken on tin, quicksilver, barium, titanium, sulfate and others.

A satisfactory specific test for lead has not yet been devised. At present the only available short-cut colorimetric method for lead involves the use of cyanide, a hazardous reagent in the hands of inexperienced personnel.

Tests detect geochemical "anomalies"—local deviations from the average chemical composition of a naturally occurring material. Geochemical anomalies have been reported in virtually every substance that is found naturally at the earth's surface, even in animals and insects. The host materials of greatest importance in prospecting are: rock, soil, alluvium, vegetation, and water.

Although chemical anomalies related to buried ores come in a bewildering range of sizes, shapes and hosts, two general types have been recognized: the "primary" anomaly, developed by ore-forming solutions in



Idealized diagram of primary geochemical anomaly

the rock along solution channelways (see Fig. 1); and the "secondary" anomaly, developed by dispersion at the surface of weathering products of primary ore in solids, alluvium, vegetation and water. Either one may be detected and may serve as an indicator of buried ore bodies.

Primary Dispersion of Metals

The primary geochemical anomalies in the Tintic district and their relations to other geologic features have received the most intensive study of any in this country. There a capping of pre-mineral rhyolite of variable thickness overlies the Paleozoic ore-bearing limestone host rocks. Petrographic and mineralogic studies of the rhyolite reveal a complex history of various ages and types of alteration over the blind ore shoots in the limestone. Lovering and co-workers have identified a late-stage pyritic alteration in rhyolite directly overlying some of the ore bodies. However, "the surface projection of a blind ore shoot commonly covers less than 10 percent of the pyritic halo in the lava, and some of these late-stage pyritic-alteration areas are not associated with ore." Thus studies of alteration halos, although indicating general areas of mineralization, do not help in pinpointing the deep-lying ore.

Analyses of altered rhyolite for traces of heavy metals, however, bring out a pattern not apparent in mineralogical studies. In the pyritized rhyolite over known ore at Tintic Standard, and later over other ore bodies, geochemical anomalies covering a relatively small area and located more or less directly up-rake from blind ore bodies were found by chemical tests of pyritized rhyolite. These chemical patterns are described as the effect of disseminated metals left by the near-spent ore-forming solutions on their way upward along fracture-zone channelways.

A similar geochemical pattern has been observed by J. A. Riddell of McGill University in alteration halos over blind sulphide bodies at Noranda, Quebec. He used a minor variation of Lovering's analytical technique, and took samples from drill cores instead of outcrops. However, he found the same kind of chemical pattern over deep ore at Noranda as Lovering reported from Tintic.

Primary geochemical anomalies are not restricted to silicate rocks. John Cooper and Lyman Huff of the Geological Survey describe a primary chemical anomaly in partially silicated and altered limestones and dolomites at Johnson, Ariz. In the Tri-State district, J. A. Harbaugh of the University of Kansas found a higher-than-average zinc content in oak leaves growing where the ore-bearing horizon is well below the root zone of the trees, indicating that the excess zinc must have come from the rocks above the ore. Tests by V. C. Kennedy in the southwestern Wisconsin zinc district showed that for a vertical distance of 50 ft or more above flat-lying ore shoots the rock was abnormally high in zinc.

Many questions regarding primary geochemical anomalies are difficult to answer with the present limited knowledge. Only intelligent guesses can be made as to the minerals containing the traces of metals. The vertical extent of several chemical anomalies over blind ore are known to be more than 500 ft above the top of the ore shoot. The maximum depth at which buried ore can be detected at the surface is unknown and we do not know whether primary anomalies over deep ore are common, or simply freaks of no general significance.

Secondary Dispersion of Metals

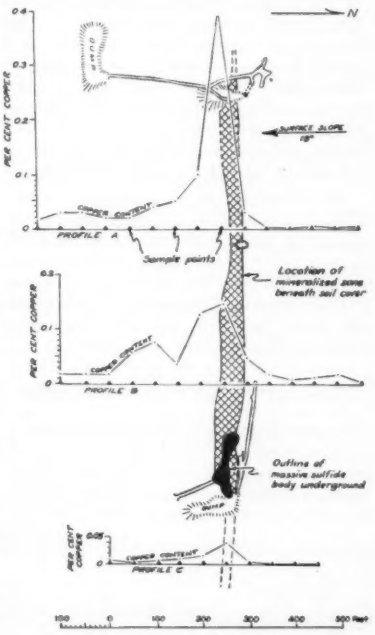
Secondary dispersion of metals from ore deposits in many respects is easier to detect because secondary anomalies are easier to observe and study. Also, many more experimental surveys have been conducted on the distribution of ore metals in weathering products of near-surface ore.

Metal leached or otherwise removed from an oxidizing ore deposit have a choice of a great variety of routes between point of departure from the primary ore and ultimate resting place in the ocean. Some is held in relict primary minerals such as cassiterite, that may eventually enter drainage as heavy minerals in the alluvium. Some metal is dissolved and carried out in ground and surface water. Some may be immediately redeposited in gossans or residual soils. Some may be taken up by plants and trees, where they are temporarily concentrated in living vegetable tissue. Erosion may remove the metals as part of stream sediments.

Each of these routes in the cycle of weathering suggests a prospecting method for the ore body where the metal originated. In appraising large areas for possible mineralization, studies of stream water and alluvium may give the answer. Where detailed hot-spots are sought in a mineralized area, chemical tests of residual soil or slope rubble may point to the location of ore buried by overburden. Where the ore-bearing formation is blanketed by shallow non-residual cover such as glacial moraine, talus, the deep tap-roots of trees may penetrate and take up metal from the underlying ore detectable by chemical analysis of plant organs.

The metal content of residual soils and gossans appears to give the most direct and reliable indication of primary ores. Experimental geochemical surveys conducted on residual soils developed from known ores and mineralized veins reveal that the residual material consistently contains higher-than-normal concentrations of ore metals. The converse does not follow, however, as under some special conditions local accumulations of metal in residual soil can develop over essentially unmineralized rock.

The Malachite mine shows a typical example of a geochemical anomaly in residual soil. (see figure 2). The ore consists principally of chalcopyrite and pyrrhotite in a steeply dipping vein. Profile A crosses the vein where oxidized sulphides are exposed in an old



Copper content of soil at Malachite Mine, Colorado

pit. Profile B crosses it 100 ft west of a recent discovery. Profile C shows the geochemical anomaly on the projected extension of the vein. The land slope is approximately 18 degrees to the south, and soil creep down the slope is fairly active. This is reflected in the geochemical data by the high copper content of the down-slope soils.

This example is from the Rocky Mountain area of rugged topography moderate to slight rainfall, and immature soils. In eastern climates, characterized by mature soils, the metals in residual soils may be leached from the surface horizons, making it necessary to collect auger samples at depths of two ft or more. In northern climates there is evidence that the metals, instead of being leached, are concentrated in the surface layers, perhaps by accumulation of metal-rich remains of leaves from trees growing over mineralized ground. Tropical soils present still a different problem.

Alluvium should represent a natural-

ly composited sample of material from the entire watershed above the point tested. Experimental work confirms this assumption. Heavy-mineral studies of alluvium have long been useful in locating hard-rock deposits of gold, cassiterite, wolframite, and other heavy and resistant minerals. With chemical techniques, it is possible to determine also the distribution pattern of metals like zinc and copper. Experiments show that tests for these metals in the fine-grained fraction of alluvium can lead upstream to the point near their source where the metals entered the drainage.

Water analysis has certain limitations as a prospecting method, even though a satisfactory portable test outfit for heavy metals in waters is available. Metallic ions are subject to the scavenging effect of colloidal particles, carbonaceous material and living organisms, plus the effect of variations of pH on their solubility.

Plant sampling, as already mentioned, comes into its own where the sampling power of deep root system is needed to penetrate non-residual cover. The most outstanding successes of these so-called biogeochemical methods have been in the glaciated terranes of Scandinavia and Canada.

Present Status of Methods

Where do we now stand with respect to the new chemical techniques of mineral exploration? In the first place, a large number of known deposits have been "rediscovered" in the course of experimental work on various geochemical methods. In Scandinavia and particularly in Russia, a substantial number of important discoveries have been reported. On this continent, at least one commercial ore body has been found. The faulted and pinched extensions of several known deposits have been located and sub-commercial mineralized ground has been discovered in many places.

The methods are sufficiently promising to have encouraged more than 10 independent mining companies in the United States and Canada to undertake experimental or applied geochemical work on their properties.

The U. S. Geological Survey with a staff of 15 men is pushing its program of developing new or improved geochemical tests, and conducting experimental field surveys. The Survey's aim is to perfect new prospecting methods for the benefit of the industry as a whole. With that in mind its staff in the geochemical prospecting laboratories in Denver, and Beltsville, Md., has been placed at the disposal of the public for demonstration of chemical techniques or consultation on field problems.

Geochemical prospecting is still in the experimental stage. The methods show promise, but they should not be applied blindly and without good geological or chemical guidance. In incompetent or unscrupulous hands, they may result only in failures, frustration, and the same kind of disillusionment with which mining geophysics has been regarded by many mining men.

Geochemical Prospecting in the Park City District

By RAY E. GILBERT,
Chief Geologist,
New Park Mining Co.

SINCE June 1949, the New Park Mining Co. has been conducting experiments in geochemical prospecting on its property in the southeastern part of the Park City district, Utah. Ore in the area studied is found principally in veins localized along faults and fractures cutting Paleozoic sediments and quartz diorite intrusives. The veins are predominantly quartz with varying quantities of the sulphides of lead, zinc, and some copper. Practically all vein outcrops and most rock outcrops are concealed under an extensive residual soil cover, 5-30 ft thick.

Geochemical work has been confined largely to study of concentrations of zinc and combined zinc and copper in the soil cover. Tests were first conducted over buried outcrops of the two producing veins of New Park's Mayflower mine, and the work has since been expanded to prospect unexplored areas. Results of these tests indicate that the methods used will detect heavy metal halos or dispersion patterns in the soil resulting from the weathering of mineralized veins.

Field Procedures Employed

Sample Spacing—Sampling is done on a pre-arranged geometrical pattern of either a checkerboard network, sampled at the corners of each square, or a series of parallel lines, sampled at regular intervals.

The sample spacing chased depends on the expected size of dispersion halos in the area being investigated. Anomalies outlined in the New Park area could have been detected with a preliminary grid of 200 ft squares. Any point that runs higher than average is resampled and additional samples are taken with the spacing half that of the initial pattern.

Where vein structures are known to exist, time is saved by using a smaller grid. When the general trend of the veins is known, profile lines are usually run at right angles. Lines 100 ft apart, sampled every 50 ft, yield a rough metal content pattern that can be checked and detailed by sampling selected points between lines.

Sampling—The humus layer is scraped away with a sample pick, and 10-20 gm of the first soil encountered, usually at a depth of 3-6 in., with twigs and pebbles sorted out, is transferred to a sample mailing envelope. The sample location is written on the envelope in pencil, and the point is marked with a strip of red cloth tied to a bush or tree limb. Usually every other sample point is marked with a 2-in. square aluminum tag having an identification number stamped on it.

Samples are taken at a depth of only a few inches as taking a sample at a depth of as little as 18 in. is difficult and time consuming. Also, the topsoil seems to contain as much or more zinc than the soil at a depth of 1-3 ft, especially over mineralization, so that the shallow samples tend to emphasize the mineralized areas. This is illustrated in fig. 1, which shows the "total metal"* content of two sets of samples taken on a line across the suboutcrop of New Park's Pearl vein. One set was taken at a depth of 4 in., and the other at a depth of 2 ft.

In Table I are listed samples taken on the sides of a bulldozer trench. The high values at a depth of 15 ft were in material rich in iron oxides, on or near bedrock. Samples taken from a shallow trench in an area of

Table I—Total metal content of soil at depths up to 15 ft; Star area.

Depth Feet	Total Metal*	—Parts per Million	
0.3	650	500	500
1	...	450	300
3	225	250	250
5	350	975	425
7	650	...	...
9	250	...	...
13	3,000	...	4,000

* The "total metal" group includes zinc, copper, and probably minor amounts of other heavy metals that react with dithizone in a pH range between 4.5 and 5.0. Lead does not react in solutions of this pH.

Table II—Total metal content of soil at depths up to 4 ft; Glenco area.

Depth Feet	Total Metal	—Parts per Million	
0.3	425	375	300
1	250	150	100
2	225	100	150
3	300	150	250
4	375	...	250

intermediate values are shown in Table II.

Hibbard describes and explains similar zinc enrichment as caused by the action of plants in bringing minerals up from the subsoil, subsequently decaying, and leaving the heavy metals fixed in the topsoil. This explanation seems logical for the New Park area, since it is covered by a heavy growth of aspen, oak, maple, and other plants, and the topsoil is rich in decaying material from this growth.

Results of resampling 25 representative stations are shown in fig. 2. Two samples were taken from points not more than a few feet apart, and analyzed for "total metal." Variations of 75 to 150 ppm are common, but only occasionally is the difference as much as 200 ppm, and hardly ever is it more than 200. These variations are not great enough to conceal the anomalies indicative of mineralization, where values are generally above 600 ppm, compared to a range of 200 to 400 ppm in barren areas. Of course, the closer the sample spacing and hence the larger the number of samples taken per unit area, the less chance there will be of overlooking an enriched zone because of variations in individual samples.

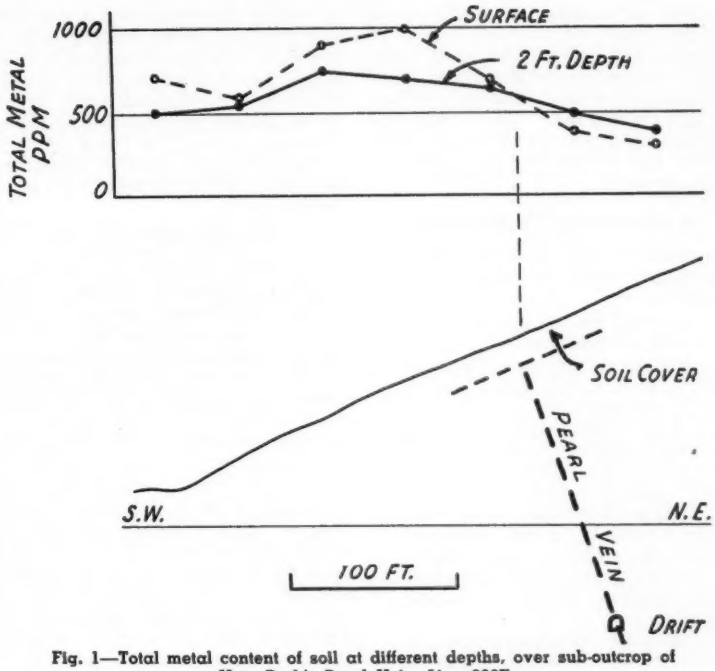


Fig. 1—Total metal content of soil at different depths, over sub-outcrop of New Park's Pearl Vein, Line 200E

Reconnaissance Sampling—One man, equipped with aerial photographs or a topographic map, takes the samples, spacing them by pacing, and locating approximate positions on the photographs or map. Each sample point is marked with an identification tag. This preliminary sampling is followed by detailed sampling around any points found to contain higher than average values.

Detail Sampling, Thick Brush—Where plane table and alidade cannot be used for mapping, control stations are set with transit and chain on lines 1000-2000 ft apart, roughly parallel to the expected trend of any veins. Parallel profile lines are run with Brunton compass and cloth tape. Vertical angles are measured with the Brunton, slope distance corrections are made from a table, and sample points are located at fixed horizontal distances. Vertical distances are read from a table, elevations are calculated, points are plotted on a scale of 1 in. equals 100 ft, and contour lines are sketched, on 8½ by 11-in. cross-section paper. Notes are made on the same sheet concerning type and amount of float, outcrops, any evidence of mineralization or faulting, as well as any indication that the top soil may be transported rather than residual. The lead man takes the sample and marks the station, while the rear man keeps him on line and keeps the notes.

The line is continued to the next transit control line and tied into it, or the adjacent profile line is run back and tied into the starting control line. In either event, errors in bearing, distance, or elevation, are balanced out along the length of the Brunton traverse before it is posted on the base map.

Detail Sampling, Open Country—Where plane table and alidade can be used, control stations are set with transit and chain, or by triangulation. Sample lines are run with a Brunton, but vertical angles are measured only if the slopes are steep enough to require correction for horizontal distance. Elevations are not carried. Sample points are plotted and notes on

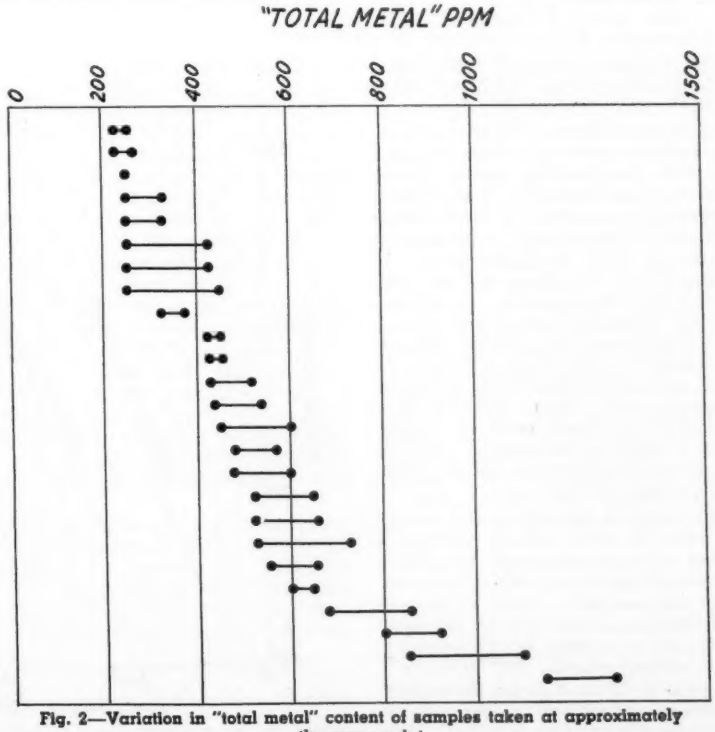


Fig. 2—Variation in "total metal" content of samples taken at approximately the same point

geology are made as described in the preceding method.

Topography is mapped on a plane table, and end points and a few intermediate points on the sample lines are located on this map. Any errors are balanced out on the Brunton lines before the information is posted on the base map.

Laboratory Procedure

Reagents: Water: Distilled water or tap water passed through a Bantam demineralizer.

Bisulfate flux: Either potassium or sodium bisulfate, C.P.

Acetate buffer: Equal parts of 2N sodium acetate and 2N acetic acid. Dissolve 136 gm $NaC_2H_3O_2$. $3H_2O$ in 300 ml water, add 4.5 ml glacial acetic acid, make up to 500 ml with water. Clean by shaking with dithizone solution.

Sodium Thiosulfate: Dissolve 25 gm of $Na_2S_2O_3$. $5H_2O$ in water and make up to 250 ml with water.

Carbon Tetrachloride: Bulk quality from chemical supply house.

Dithizone (Diphenylthiocarbazone) stock solution: (.01 percent solution)—Dissolve 50 mg dithizone in 500 ml of CCl_4. Keep in cool, dark place.

Dithizone test solution: (.0025 percent solution)—Measure 25 ml of dithizone stock solution from a burette, make up to 100 ml with CCl_4 in a glass stoppered 100-ml graduate. Shake to mix. Make up as needed.

Zinc Standard solution: (100 micrograms Zn/ml)—Dissolve 50 mg of reagent grade 30-mesh zinc in slight excess of HCl and dilute to 500 ml with 0.1N HCl.

Analytical Method—The colorimetric method used is essentially the same as that described by Lakin, et al., with the modification for "total metal" estimation suggested by Huff. Fine soil, as free as possible from organic material and rock fragments, is selected from the total sample with a stainless steel spatula. A 0.5 gm portion is weighed on a beam balance and transferred to a 26 by 200-mm test tube, to which 3 gm of bisulfate flux, measured roughly with a plastic spoon, is then added. Samples thus prepared are fused seven at a time over a single burner gasoline stove in a special test tube holder until a bright orange melt results.

The melt is allowed to cool, 25 ml of water is added and the mixture is boiled on a hot plate until the fusion button disintegrates. When the solution has cooled, a 1-ml aliquot is pipetted into a 13 by 100-mm test tube, and 5 ml of acetate buffer is added. The buffered solution (pH about 4.7) is transferred to a 60-ml glass stoppered separatory funnel and 5 ml of dithizone test solution is added. This is shaken vigorously for one minute. This produces colors ranging from the green of unreacted dithizone through lavender to a pink caused by reaction of all the dithizone with heavy metals. If the color is this "saturation pink," dithizone solution is added in 5 ml increments, with shaking after each addition, until a mixed color is obtained.

The dithizone layer is dropped into a 13 by 100-mm test tube and the "total metal" content is determined with the photometer described below. If the "total metal" is greater than 300 ppm, the dithizone layer is returned to the solution in the separatory funnel, 1 ml of sodium thiosulfate is added, the shaking is repeated, and the resulting mixed color is measured in the photometer and recorded as zinc.

Preparation of Standards—To a series of 26 by 200-mm test tubes, each containing 3 gm of bisulfate flux, portions of zinc standard solution are added, starting with 0.5 ml and going up in 0.5 ml steps to 4.0 ml of standard solution. Total volume of each is made up to 25 ml with water, and the mixture is boiled to dissolve the bisulfate. One ml of each solution is pipetted into a separatory funnel, 5 ml of acetate buffer, 1 ml of sodium thiosulfate, and 5 ml of dithizone test solution are added. The mixture is shaken for one minute, the dithizone layer is transferred to a 13 by 100-mm test tube, and its light absorption is measured in the photometer. Using this information, a curve is constructed from which the zinc content of any mixed color dithizone solution may be determined by its meter reading. "Total metal" values are determined from this same curve, so that they are really expressed as being equivalent to so much zinc, in parts per million.

The standards thus prepared contain from 2 to 16 micrograms of zinc per 5 ml of dithizone solution, in increments of 2 micrograms. In the analytical procedure described above, the series corresponds to zinc values varying from 100 to 800 parts per million, in steps of 100. When the amount of dithizone used is doubled, these values are doubled, making the range of the curve from 200 to 1600 ppm.

Photometer—The light source of the home-made photometer used in the determinations consists of a constant voltage transformer with a 6-v output, a 2-ohm potentiometer, a toggle switch, and the reflector head and bulb of a miners' cap lamp. The bulb used is a double filament type, and the head is wired with the filaments in parallel.

A 2 by 2-in. square of one-eighth-in. colored Plexiglas (Orange No. 354) serves as a light filter, and is placed between the light source and the test tube slot. Any narrow-band filter with maximum transmittance close to 620 millimicrons should be satisfactory.

The light meter used is a G.E. Model DW-58 exposure meter with hood removed, so that the photoelectric cell fits against the test tube slot opposite the light source. Any exposure meter capable of measuring incident

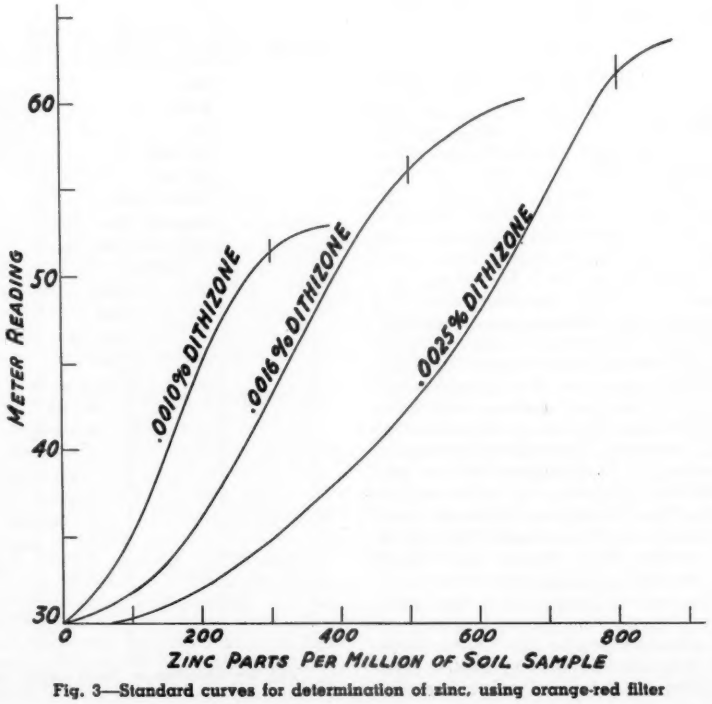


Fig. 3—Standard curves for determination of zinc, using orange-red filter

light, and having a cell area of about ½ by 1½-in. should serve as well.

The test tube holder is a block of wood with a hole drilled in the center to make a snug fit for the 13 by 100-mm test tube, with ⅜ by 1¼-in. slots on either side, to permit the passage of light through the center portion of the test tube. The same test tube is used for all tests, to eliminate errors caused by variation in diameter or wall thickness.

The 2-ohm potentiometer is used to set the light intensity to the same value each day by varying the current until the light passing through unreacted dithizone test solution yields the same meter reading as was obtained when the standard curve was constructed.

Curves obtained with this instrument, using three different strengths of dithizone test solution, (.0010, .0016, and .0025 percent), are shown in fig. 3. The stronger dithizone solution is generally used, since it provides a wider range of values, with the steeper part of the curve above 300 ppm. In an area of consistently low values, where it might be important to detect small variations below 300 ppm, the weaker solution would give better results, and the intermediate solution would be best in a range between 150 and 500 ppm.

Other Equipment—The mechanical shaker is designed after a suggestion by Kingman. It is powered by a small 1750-rpm motor, geared down to a shaking speed of 165 cycles per minute. A timing switch from a photographic enlarger insures the same shaking time for each sample.

A length of 2 by 4-in. wood with matching pairs of holes for the big and little test tubes makes a handy rack to hold a group of sample solutions while the aliquots are pipetted and the buffer solution is added. A small ventilation hood equipped with a 400-cfm fan is sufficient to clear away fusion fumes.

Recording Results

All data are plotted on 28 by 36-in. sheets of tracing cloth, on a scale of one inch equals 100 ft. A base map is made, showing the location and identification numbers of all survey stations and sample points, and separate overlays are made of the following: one of mining claims and property boundaries, one of any underground workings and geology, one of topography and surface geology, one of "total metal" values, and one of zinc values.

The topography and surface geology sheet contains all geologic information noted on the surface, plus projections of any structures exposed in underground workings, plus interpretations of any geophysical work conducted to determine concealed rock types. Interpretations of geochemical data are noted on this sheet in pencil.

"Total metal" values are posted on a separate sheet and contoured at an interval of 200 ppm, up to 1000 ppm. The next contour interval is from 1000 to 1500 ppm. All values greater than 1500 ppm are grouped in one unit. In areas of high "total metal," zinc values are posted on another sheet and contoured in the same way.

Personnel

A three-man crew was found to be most convenient to handle all of the field, laboratory and office work involved in soil sampling. In reconnaissance sampling, one man in the field can keep two men busy in the laboratory, and in more detailed sampling, one man in the laboratory can keep up with two men in the field, provided that one of the field men helps in the lab when the other is bringing the maps to date in the office. Although men with less training could be used on most of this work, college graduates with education in geology, engineering, and chemistry are preferred. Each man should be capable of doing both field and laboratory work.

A trained crew does well to collect and analyze an average of 45 samples per day, or 15 samples per man-shift. This figure may be higher in reconnaissance sampling or in brush-free areas, and will be somewhat lower in areas of thick brush and steep slopes.

Sampling on a 200-ft checkerboard for reconnaissance work would require roughly one sample per acre. Based on the 45 samples per day average, preliminary sampling could be conducted at the rate of 15 acres per man-shift. Sampling in more detail along profile lines 100 ft apart, with samples taken every 50 ft on the lines, slows the rate down to less than two acres per man-shift.

Conclusion

Geochemical prospecting, as applied in the southeastern Park City district, shows promise of indicating zinc mineralization where the mineralization has been exposed to erosion, and where the covering soil is residual, even though its depth may be as great as 20 ft. In areas of abundant and long-persistent vegetation, it appears that samples of topsoil will yield results as satisfactory as samples taken at a depth of several feet. Simple and rapid quantitative tests for zinc and for combined zinc and copper, adopted from those developed by the U. S. Geological Survey, seem adequate for outlining areas of soil rich in zinc and copper.

Structure of East Tintic District Modified

By T. S. LOVERING
Staff Research Geologist
U. S. Geological Survey,
Washington, D. C.

A DRILL hole put down by the U. S. Geological Survey may change the ideas of the geology of the East Tintic District. This District is about 60 miles south of Salt Lake City, and is noted for blind orebodies in carbonate rocks under a cover of lava that hides both the structure and the ore. Several years ago, after the USGS had completed a substantial part of their maps of the alteration, structure and surface rocks, based in part on the geochemical prospecting evidence, the Newmont Mining Co. put down some churn drill holes in an area of alteration well to the east of any known mineralization. These holes were abandoned at the water level because it was thought it would be unprofitable to mine anything below that level.

Because these churn drill holes had proved the presence of carbonate rock, indicated by geochemical methods, where previous projection of the geologic structure had envisioned only the Tintic quartzite directly below the lava.

A diamond drill hole drilled from 1100 ft to 1600 ft showed some startling results. The core recovered was mostly dolomite, with some sandstone and shaly sandstone. It also contained jasperoid which showed mineralization running up to about 2.7 percent combined lead and zinc. Below the jasperoid was dolomite again. This section lacked limestone and would be completely bewildering if it were not for the startling fact that there were horn corals that were either Devonian or Mississippian. It was thus shown that instead of being in the section of ground first anticipated, that is approximately 400-500 ft above the Tintic quartzite, the horizon penetrated is more nearly 4000-5000 ft above the Tintic quartzite, and an amazing section of carbonate rock is exposed beneath the lava where prior to drilling there was apparently no hope of host rocks for replacement orebodies.

A series of fractures were penetrated above the jasperoid in a section of substantial thickness in which sphalerite and galena are easily visible. When the geology of the area containing the Tintic Standard, the Eureka Standard, the North Lily and the Iron King orebodies was plotted

(*Continued on page* 84)

Published by permission of the Director, U. S. Geological Survey.

Adding New Facilities To America's Industrial Might!

Middle bay of new Kenosha copper tube mill showing 100-foot, triple-die draw benches and annealing furnace.

Faster production, higher precision, greater efficiency! These are the answer of American industry to the enemies of world freedom. Typical of the achievements that help the nation's industrial mobilization is the current mill improvement program of The American Brass Company.

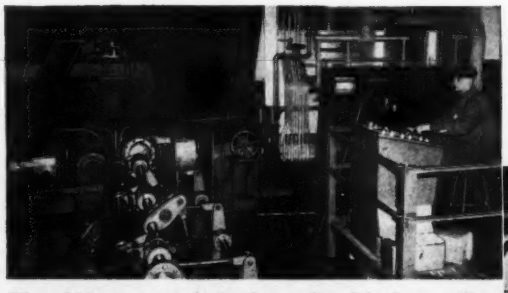
A recently completed phase of that program is the new copper tube mill at the Kenosha, Wisconsin, Branch. This plant produces large quantities of highly essential copper tubing—and produces it more efficiently than ever before. An important feature of the mill is the high-capacity Mannesmann tube-forming machine used to convert cylindrical billets into heavy-walled seamless copper tubes. The Midwestern location of the Kenosha mill speeds delivery to industrial plants across the nation.

Right now the country's defense needs have first call on Anaconda Copper, Brass and Bronze. But finer things for a world at peace are sure to result from our plant improvement program. These mighty metals serve your freedom today—your comfort and convenience tomorrow. 51322A

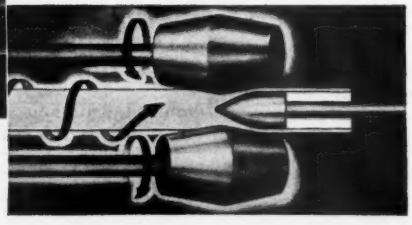
ANACONDA®

First in Copper, Brass and Bronze

The American Brass Company
Anaconda Wire & Cable Company
International Smelting and Refining Company
Andes Copper Mining Company
Chile Copper Company
Greene Cananea Copper Company



View of Mannesmann tube forming machine. The diagram illustrates the Mannesmann process whereby the roller action creates the cavity that is kept centered by the stationary mandrel.



With the *Defense Agencies*

AS defense officials were preparing to change over to a full Controlled Materials Plan in the fourth quarter in order to facilitate industrial output, the IUMMSW reduced copper production to a mere trickle by striking mines and plants across the country on August 27.

The President quickly invoked the national emergency provisions of the Taft-Hartley Act, and the board of inquiry which he established found that the strike posed a serious threat to defense production. Swift action by the Justice Department resulted in the U. S. District Court at Denver issuing an 80-day injunction on September 5, directing the striking miners in the nonferrous mines to return to work. Union leaders ordered the men to return to the mines, but their response was slow and production did not reach normal for several days.

Prior to this the union and the Kennecott Copper Corp. had agreed on wage increases averaging 15 cents an hour and a pension plan costing approximately 4½ cents an hour.

The strike posed the first serious threat to the rearmament drive and represented a determined effort to break the Government's wage control pattern.

Elsewhere on the wage stabilization front, WSB has eased regulations governing merit-pay and length-of-service increases to employes and adopted a plan permitting wages to rise as much as the cost of living.

ODM Director Wilson has also come out for the continuance of premium pay for more than a 40-hour week and has frowned upon lengthening the work week to 48 hours except in a few industries where it will increase production efficiency.

New Minerals Agency

On August 1, the President created a new Defense Materials Procurement Agency in the Office of Defense Mobilization and named Jess Larson, General Services Administrator, to head it up. He said that the new agency was established to assure the continued supply of critical and strategic materials.

Transferred to the new agency were most of the functions of the Defense Minerals Administration, materials procurement responsibilities of the General Services Administration, and materials procurement actions of the Economic Cooperation Administration.

Larson has spent the past few weeks in assembling a staff and working out the administrative details of the new agency. He expects to lean heavily upon industry leaders in the operation of the organization.

Larson told Western Senators that he placed the development of American sources of strategic and critical materials at the top of his list of objectives. He declared that "the mining industry of the United States must be put in a position where it can operate profitably, under a program of such consistency and continuity that the industry will not only know where it stands today, but also know what the situation will be for at least three years in advance."

Meanwhile Wilburn C. Schroeder, former chief of the Synthetic Liquid Fuels Branch of the U. S. Bureau of Mines, was named acting administrator of the Defense Minerals Administration, succeeding Dr. James Boyd who returned to his post as Director of the Bureau of Mines.

Mines Priorities Orders

The National Production Authority has issued a new mining order, NPA Order M-78 (a counterpart of the famous World War II P-56 Order), effective August 6, which provides for special priorities assistance to the metal and nonmetallic mineral mining industries. The order establishes the procedures whereby mines and treatment plants can obtain materials for maintenance, repair and operation and for making both major and minor capital additions.

A similar order is being issued to take care of the needs of the coal mining industry.

Stockpile Releases

As a result of the strike at the Garfield plant of the American Smelting and Refining Company, President Truman authorized the release, on a loan basis, of up to 25,000 tons of copper from the national stockpile to meet defense production needs. The copper is to be released by the Munitions Board, as needed, to the General Services Administration for sale in accordance with allocations of the National Production Authority. ODM Director Wilson revealed that 10,000 tons of the total authorized had been released up to August 17. The stockpile must be reimbursed by an equal amount by June 30, 1952.

Meanwhile, rumors were prevalent that deliveries of zinc to the stockpile during the third quarter would be halted in order to make more metal available for industrial use.

Tax Amortization

The Defense Minerals Administration has announced that through August 14 it had recommended some 246 applications for accelerated tax amortization. It said that 102 of these had been certified to the Treasury Department, 17 had been withdrawn and 33 denied.

In the latest list of 137 DMA-approved applications, the facilities to be constructed represented a cost in excess of $1.2 billion of which an average of 78 percent had been recommended for rapid tax write-off.

The applications involved most of the major critical and strategic metals

(*Continued on page* 85)

Plans Mature for Well-Rounded Meeting in Los Angeles

OCTOBER 22-24 is circled in red on the calendar of every mining man, for it is on those dates that the Western Division of the American Mining Congress will hold the 1951 Metal and Nonmetallic Mineral Mining Convention at Los Angeles' Biltmore Hotel. Mining men from all over the country who gather there will hear from prominent leaders in national life and in industry. An imposing list of the nation's top-flight engineers, business leaders, mine operators and government officials will address the Convention on problems which are uppermost in the minds of mining men. Among these are: Assistant Secretary of the Army Karl Bendetsen, Rep. Thomas E. Martin of Iowa, and leading officials in the defense agencies will speak on progress in defense mobilization. Jess Larson, newly appointed Administrator of the Defense Materials Procurement Agency, Howard I. Young, President, American Mining Congress, who is to serve with Larson in mineral matters, Dr. James Boyd, Director, U. S. Bureau of Mines, John D. Small, Chairman of the Munitions Board, and Harold A. Montag, Director of the Mining Machinery Division of NPA, will discuss the defense minerals program.

One of the highlights of the meeting will be an address by Hon. Lewis W. Douglas, former U. S. Ambassador to England, who has just returned to the U. S. Another featured speaker will be Wage Stabilization Board Chairman, Nathan P. Feinsinger, who will give his views on wage stabilization policy.

The program for the meeting will also include discussion of the latest operating advances made in metal and nonmetallic mineral mining, priorities and allocations assistance for the mining industry, an exhaustive study of the exploration, development and expansion plans of the industry, manpower and labor relations, taxation, and public land policies. One session is slated for a shaft sinking symposium, another to progress in rock drilling, another to advances in milling, and special conferences will be held devoted to strategic minerals, uranium mining, gold and monetary problems, taxation, rock bolting and roasting and sulphur recovery.

Declaration of Policy

A 31-man Resolutions Committee has been appointed by Western Division Chairman Harvey S. Mudd to prepare and submit to the Convention a series of resolutions dealing with national policies as they affect the mining industry in this critical period. Donald A. Callahan of Wallace, Idaho, Vice President of the American Mining Congress, has been named Chairman of this Committee and a number of subcommittees have been appointed to give advance consideration to topics of major importance.

Members of these committees are exerting every effort to prepare a declaration of policy which will represent the considered viewpoint of the entire mining industry. To this end, they will welcome comments and suggestions from any member of the industry. These may be in the form of

—Preliminary Program—

Monday, October 22

10:15 A.M.—INDUSTRIAL MOBILIZATION

Progress in Mobilizing for Defense . . . How is Mining Affected

The Defense Program—Its Dependence on Raw Materials

What's Wrong With Our Minerals Supply? . . . Roadblocks to Greater Output

12:15 P.M.—WELCOMING LUNCHEON

Lewis W. Douglas in an Off-the-Record Talk

2:30 P.M.—DEFENSE MINERALS PROGRAM

Present Status, Weaknesses, Strong Points of the Program . . . Plans for Future . . . DMPA Administrator Jess Larson . . . Howard I. Young . . . Other Defense Officials . . . USBM Director James Boyd . . . USGS Director William E. Wrather . . . NPA Mining Machinery Director Harold A. Montag

Analysis, Discussion and Questions by Industry Leaders, Representing Small and Large Operations

2:30 P.M.—MILLING PROGRESS

Innovations in Processing Strategic Metal Ores

Classification Methods . . . Heavy Media Separation . . . The New "Centriclone" . . . Dutch State Cyclone Experience . . . Etc.

Tuesday, October 23

9:30 A.M.—MINING DEVELOPMENT AND EXPANSION

What Does the Future Hold?

Expanding our Mineral Supplies—a symposium
Copper . . . Lead-Zinc . . . Iron Ore . . . Sulphur . . . Strategic Metals . . . Nonmetallic Minerals

9:30 A.M.—ROCK DRILLING

Economic Limits of Lightweight Drilling Equipment . . . How Light Can Machines and Drills Be? . . . Which Drill Bits Are Suited to Hard Rock? . . . Experience With Airleg Drill—Performance—Latest Improvements—Applications

2:00 P.M.—MANPOWER—LABOR RELATIONS

Government, Industry and Military Viewpoints on Manpower . . . Supply . . . Deferments . . . Pirating . . . Lessons Of World War II

Wage Stabilization Board Policies

Trend of Recent Contract Negotiations

2:00 P.M.—SHAFT SINKING

Freezing Through Quicksand . . . Water Problems Met and Solved . . . Machinery Adapted to Special Conditions . . . Present Practice Summarized

Wednesday, October 24

9:30 A.M.—TAXATION—PUBLIC LANDS

Developments in Federal Taxation . . . Income Tax . . . Excess Profits Tax . . . Provisions Affecting Exploration, Development and Expansion of Production

The Mining Laws—Do They Impede Resource Development?

9:30 A.M.—MECHANIZED MINING

Large Scale Mechanical Mining of Gravel Deposits in Southern California

Heavy Duty Trucks on the Iron Ranges

Improvements in Blasthole Drilling at Open Pit Mines

Mechanical Mining in Nonmetallic Mines

2:00 P.M.—SPECIAL CONFERENCES

Rock Bolting

Uranium Mining

Roasting and Sulphur Recovery

Taxation

Gold and Monetary Problems

Strategic Minerals

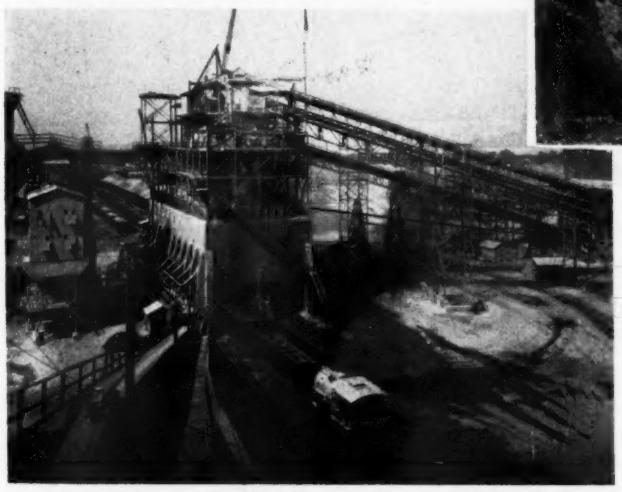
7:30 P.M.—ANNUAL "SPEECHLESS" BANQUET

proposed revisions or amendments to the declaration adopted at Salt Lake City last year (see the October 1950 JOURNAL), or may include views on any other subjects on which mining men feel the industry should take a public stand.

For convenience in transmitting these to the chairmen and members of the subcommittees, suggestions should be sent in writing to the American Mining Congress in Washington.

The full Resolutions Committee, which will meet in Los Angeles on Saturday, October 20, will also be prepared to devote a reasonable amount of time to hearing directly from mining men who wish to supplement their written recommendations. Anyone wishing to submit personally his views on a specific subject should advise the Mining Congress office in Washington at an early date, setting forth fully the substance of what he wishes to present. Following the successful practice of recent years, the report of the Committee will be submitted in sections, at appropriate points during the various sessions. This procedure makes it possible for the Convention to give full consideration to these important industry policies, and also facilitates full coverage by the press.

Hoover Dam harnesses the Colorado River



Highly mechanized open pit pours 1000 tph into Irwindale plant

Top Flight Entertainment

While the serious consideration of industry problems is the prime reason for these annual conventions, they are justly famous also for their lighter side. Los Angeles overflows with attractions for conventioneers, and plenty of time has been allowed to enjoy them all. Special entertainment functions have also been scheduled for Monday and Wednesday evenings, October 22 and 24, where the mining men and their ladies may enjoy relaxation with friends, old and new.

The Monday event will be a dinner dance in the Biltmore Bowl, where delicious food, a fine band and the very best of entertainment will produce a gala occasion. On Wednesday the far-famed Cocoanut Grove and Embassy Room of the Ambassador Hotel will be the stage for the traditional "speechless" banquet climaxing the Convention.

Ladies' Program Special

The ladies are welcome at all Convention doings, including the field trips scheduled for Thursday and Friday, and two special entertainment features have also been arranged for them. Tuesday afternoon they will enjoy a tour of movieland, the homes of the stars and the famous Sunset Strip, concluding with a reception and tea at the home of Mr. and Mrs. Harvey S. Mudd in Beverly Hills. On the following day a luncheon in the Crystal Room of the Beverly Hills Hotel will be marked by a fashion show sponsored by I. Magnin of Beverly Hills—featuring the latest Fall creations.

Unusual Trips Planned

For Thursday and Friday excellent trips have been scheduled to such points of interest to mining men as: (a) the Crestmore Mine of Riverside Cement Co., world-famed Mission Inn, Fontana Plant of Kaiser Steel Co., and Irwindale mine of Consolidated Rock Products Co.; (b) an airplane trip to Hoover Dam; (c) the Naval Ordnance Test Station at Inyokern, and the Searls Lake deposits and processing plant of American Potash and Chemical Corp. at Trona; (d) a bus and boat trip around industrial Los Angeles and its port facilities including the famous oil wells of Wilmington and Long Beach and the Hancock desulphurizing plant.

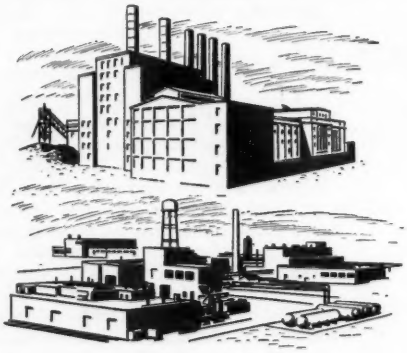
Not scheduled but good for an evening's entertainment is the "Ghost Town" at famous Knott's Berry Farm, authentic reproduction of a Mother Lode mining town of a century ago.

Advance Reservations

Advance reservations for both entertainment features and trips are strongly recommended. Order blanks have been widely circulated to the industry with preliminary programs, etc., and should be returned promptly to aid the committee in making plans, and particularly to avoid the possibility of disappointment. Any mining man who may have been missed in this mailing need only address a letter or postcard to the American Mining Congress, 1102 Ring Building, Washington 6, D. C., and full information will be forwarded promptly.

Attendance at the 1951 Metal and Nonmetallic Mineral Mining Convention in Los Angeles is a "must" for every wide-awake mining man and his wife. He can't afford to miss hearing the authoritative speakers voice their opinions on matters of national import and take part himself in the discussion of industry's problems. She won't want to miss the social events and the opportunity to see what "they" are wearing. They both will enjoy seeing all their old friends and making a host of new ones. Southern California is delightful in the Fall. Don't miss this chance to take part in the stirring events and to relax among congenial friends in unrivaled surroundings.

They're investing millions where mining *pays!*



→ In the Bituminous lands of the B&O, progress never stops. Year after year, enterprising coal producers back their faith in B&O coals with new mines and processing plants, with increased mechanization and up-to-the-minute equipment.

B&O Bituminous lends itself to modern, low-cost mining. Because of its nearness to America's industrial heart, transportation costs are moderate. Markets are dependable, and there is a wide variety of coals to meet all needs.

Smart consumers "bank on B&O Bituminous"—its sources and reserves are known and great.

Ask our man!

BITUMINOUS COALS FOR EVERY PURPOSE

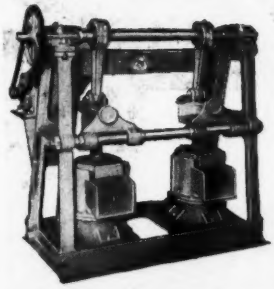
LINKING 13 GREAT STATES WITH THE NATION — B&O ®

BALTIMORE & OHIO RAILROAD

Constantly *doing things* — better!

DENVER PUMPS to Meet Your Requirements

ADJUSTABLE STROKE DIAPHRAGM PUMP



FEATURES

Length of stroke and resulting pulp flow can be adjusted while pump is in operation. Plunger rod moves in straight line vertically eliminating excessive flexing of diaphragm. Moulded rubber valve seat and diaphragms are long wearing and easily replaced. Sizes range from 2" to 6" in Simplex, Duplex, Triplex and Quadruplex units.

USES

- For metering feed to flotation circuits.
- Regulating thickener underflow.
- Pumping abrasive pulps; sludge; slimes; dense pulps; dewatered concentrates; tailings; cyanide pulps.
- Controlling large volumes of pulp.

ALSO used in CHEMICAL FOOD and INDUSTRIAL processing

WHAT USERS SAY

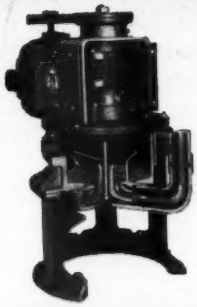
"The pump is more rugged mechanically, operates with minimum repairs, has greater suction lift and has 25% more capacity."

" . . . Greater capacity than you claim."

" . . . are best in the world."

Write for Bulletin P8-B

VERTICAL CENTRIFUGAL SAND PUMP



FEATURES

Handles any minus 1/4" material that flows by gravity. Does not air lock. Vertical design protects motor from splash . . . requires less floor space. No feed box needed, no stuffing box or packing gland required. Wearing parts easily cleaned. Alloy parts can be supplied. Wearing parts easily replaced. Sizes: 3/4", 1", 1 1/2", 2", 3" and 4".

USES

- For pumping sticky flotation froth; gravity concentrates; amalgamation barrel tailings; gritty pulps; pulps for desliming; jig products.
- Elevating pulp.
- Emulsifying reagents.
- Handling frothy pulps or intermittent feed.

ALSO used in FOOD INDUSTRIAL and CHEMICAL processing

WHAT USERS SAY

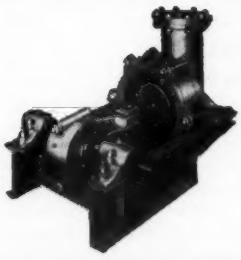
" . . . a very excellent pump —especially for pumping flotation froth or difficult pulp."

"Doing fine job as reagent emulsifier."

"Our Denver 1" pump has handled over 40,000 tons of lead tailings with only one impeller change."

Write for Bulletin P10-B

SUCTION PRESSURE DIAPHRAGM PUMP



FEATURES

Eliminates necessity of combination suction and centrifugal pumps where metered control is required. Variation in pump stroke and resulting pulp flow is obtained by adjustable eccentric. Handles abrasive materials. Sizes range from 3/4" to 6" in Simplex, Duplex, Triplex and Quadruplex units. Stainless steel construction is available in all sizes.

USES

- For pumping and elevating dense pulps to heights greater than possible with open discharge type pumps.
- Metering and regulating feed or pulp flow.
- Pumping filtrate in vacuum circuit.
- Continuous test plants.

ALSO used in INDUSTRIAL CHEMICAL and FOOD processing

WHAT USERS SAY

"Simplicity of design appeals to us."

"Superior to any other make of pump on the market."

"3/4" Denver Suction-Pressure Diaphragm Pump has been in operation continuously. Operation has been trouble-free."

Write for Bulletin P8A-B1

ALSO AVAILABLE . . . COMPLETE MILLING EQUIPMENT
"From Testing . . . to Feeder . . . to Dryer"

To DENVER EQUIPMENT CO., DENVER 17, COLORADO
. . . Please send complete information on items checked:

- ☐ Denver "Sub-A" Flotation
- ☐ Denver Wilfley Tables
- ☐ Denver Placer Equipment
- ☐ Denver Reagent Feeders
- ☐ Denver Laboratory Equipment
- ☐ Denver Amalgamation
- ☐ Denver Agitators Conditioners
- ☐ Denver Classifiers
- ☐ Denver Disc Filters
- ☐ Denver Jaw Crushers
- ☐ Denver Thickeners
- ☐ Denver Cyanidation
- ☐ Denver-Dillon Screens
- ☐ Denver Testing Service
- ☐ Denver Steel-Head Ball-Rod Mills
- ☐ Other.....

Name _____ Title _____

Company _____

Address _____

DENVER EQUIPMENT 24 HOUR SERVICE COMPANY

FLOTATION ENGINEERS

DENVER • NEW YORK • CHICAGO • EL PASO

TORONTO • VANCOUVER • MEXICO, D. F.

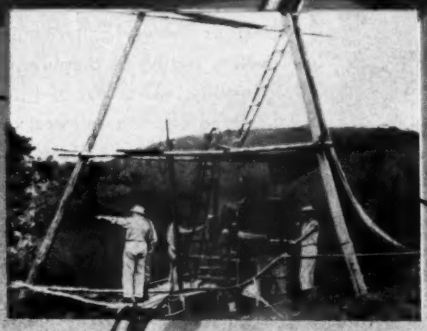
LONDON • JOHANNESBURG • RICHMOND, AUST.

"The Denver Line that makes its friends happier, healthier, and wealthier"

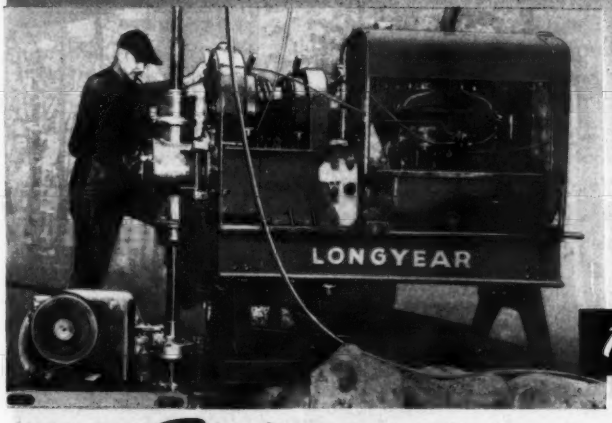
DENVER EQUIPMENT COMPANY
1400 SEVENTEENTH STREET • DENVER 17, COLORADO

60 YEARS OF Longyear CONTRACT DRILLING SERVICE . . . 'round the world

1890... E. J. Longyear drilling first diamond drill hole on Mesabi Iron Range.



Longyear contract drilling crew in Venezuela.



1950.. exploring for iron ore in Canada with a Longyear UG Straitline Drill.

Today... There is immediate and urgent need for expanding known mineral deposits and exploring for new ones. Your goals can be met quickly and economically by using LONGYEAR Contract Drilling Service because . . .

1. You get dependable samples. Without them, drilling is a waste of time and money.
2. You get experienced crews trained in modern drilling techniques.
3. You get up-to-date LONGYEAR Drills assuring rapid progress and economical drilling.

- **Speed up *your* program of surface, underground or blast hole drilling by contracting your work to LONGYEAR.**
  Write us about *your* drilling problems . . . we will show you how our service can help you. There is no obligation.

E. J. LONGYEAR COMPANY

MINNEAPOLIS, MINNESOTA, U. S. A. NEW YORK OFFICE, 1775 BROADWAY

CANADIAN LONGYEAR, LIMITED, NORTH BAY, ONTARIO, CANADA

DIAMOND CORE DRILLS • CONTRACT CORE DRILLING
SHAFT SINKING • GEOLOGICAL INVESTIGATIONS

REPRESENTATIVES IN PRINCIPAL MINING CENTERS IN THE UNITED STATES AND OTHER COUNTRIES.

Wheels of GOVERNMENT

As Viewed by A. W. DICKINSON of the American Mining Congress

THE House has cleared its legislative slate sufficiently to stand in recess from August 23 to September 12, while the Senate toils on with the remaining appropriations bills, the foreign aid measure and the revenue bill. The target date for adjournment of the Congress is now set at October 1, with Senate floor consideration of the revenue bill scheduled to begin around September 10.

The long hang-up on departmental appropriations occasioned by payroll cutting amendments was finally broken in mid-August by Senate-House agreement on the Labor-Federal Security, Agriculture, and Interior Department measures. This compromise requires the agencies affected to cut their payrolls to 90 percent of their July 1, 1951, employment levels.

Tax Bill

Working long hours at the task of rewriting the House-approved Revenue Bill of 1951, following the close of hearings August 3, the Senate Finance Committee expects to have its version of the measure ready for floor consideration shortly. Thus far the Committee has cut the $7.2 billion House bill to $5.2 billion, with action on excise tax and miscellaneous provisions still to be taken.

Tentative agreement has been reached on the increase in individual income tax, to become effective November 1 of this year and terminate December 31, 1953. This provides an 11 percent increase in present tax liability, or a special 8 percent levy on a taxpayer's surtax net income after deducting present taxes. The maximum tax liability for individuals would be upped from 87 percent to 88 percent of total income; the House version is 90 percent.

It has been agreed to increase the normal tax rate on corporations from 25 percent to 27 percent and the surtax rate from 22 percent to 25 percent. This makes the top bracket rate for corporations with incomes of $25,000 or less, 27 percent instead of the 30 percent provided by the House-passed bill. For corporations with large incomes the top bracket rate would be 52 percent, the same as under the House version. The combined income and excess profits tax rate would be 82 percent, as in the House bill. The ceiling, or maximum on the combined income tax and excess profits tax rate, is raised to 70 percent, which also is the same as that provided by the House.

Other Committee decisions would: (1) reject the House provision which would have reduced to one the number of surtax exemptions which may be claimed by a group of "related" corporations and limited the minimum excess profits tax credit to a single credit of $25,000 for the entire group; (2) eliminate the increase in the capital gains rate from 25 percent to 28.125 percent provided by the House bill for both individuals and corporations; (3) remove the House provision for withholding on dividends, interest, and royalties but retain the provision requiring interest payments to be reported on amounts over $100; (4) reduce from one-half, as approved by the House, to one-fourth the benefit afforded by income splitting to be allowed to an unmarried "head of household"; (5) approve the House provision which subjects sale of inventories of so-called "collapsible" corporations to regular income tax instead of the lower capital gains rate; (6) approve the House provision for changing the tax treatment of individuals' capital gains and losses, so as to require the offsetting of net short-term capital losses against long-term capital gains before reducing the latter by 50 percent; (7) reject the House provision which reduced the percentage of the average base period net income which may be used in computing the excess profits tax credit from 85 percent to 75 percent; and (8) set December 31, 1953, as the termination date for corporate rate increases.

Amortization Certificates

Effective August 18, Defense Mobilization Director Wilson declared a 60-day moratorium on the granting of certificates of necessity permitting a five-year amortization of defense facilities. He made an exception in the case of facilities urgently needed for the production of specific military items; for the expansion of critical raw materials output; for the "rounding-out" of vital expansion projects now under way; and projects that do not require excessive amounts of critical materials and will result in substantial contributions to the mobilization effort.

Calling attention to the tight situation in critical materials, Wilson declared it unlikely that new construction beyond that already planned can proceed for several months, except for the most urgent projects. Wilson's instructions to DPA Administrator Fleischmann are that certificates be based "on the percentage that reflects the best available estimates of post-five-year period usefulness and additional incentives to the minimum amount deemed necessary to secure the needed expansion." He also ordered that the future granting of certificates take into account the need for dispersal of facilities in accord with the new pattern established by the National Security Resources Board.

Meanwhile, up to August 14, the Defense Minerals Administration had approved 246 applications for certifi-

★ ★ ★ ★ ★ ★ ★ Washington Highlights

CONGRESS: Plans adjournment Oct. 1.
TAX: Bill to Senate floor soon.
AMORTIZATION: Sixty-day moratorium.
DEFENSE ACT: Extended to June 30, 1952.
MATERIALS AGENCY: Jess Larson new chief.
FREIGHT RATES: Increases ordered.
SEC: Congressional investigation.

★ ★ ★ ★ ★ ★ ★

cates on projects involving copper, aluminum, cement, lead, tungsten, ferrous ores, zinc, cadmium, lime, limestone, refractories, magnesium, bauxite, sulphur, and mining machinery. The operations affected are in Arizona, Arkansas, California, Colorado, Florida, Illinois, Kansas, Louisiana, Michigan, Missouri, Nebraska, Nevada, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Texas, Utah, Virginia, Washington, Wyoming, Canada and Jamaica.

Defense Act

Although the President signed the bill amending and extending the Defense Production Act through June 30, 1952, he did so "reluctantly" and has since called upon Congress to repeal, among other provisions, the so-called Capehart amendment, which permits manufacturers and processors to pass on increased costs, both direct and indirect, occurring since the Korean war began. He also urged Congress to authorize the Government to build defense plants where necessary. Government witnesses are to be heard before the Senate Banking Committee on the bills introduced to carry out the President's request but it is understood that Chairman Maybank (Dem., S. C.) of the Committee feels that the proposed changes have little chance of congressional action in the present session.

As approved, the new Act continues allocation, priorities, wage, price, rent and credit control powers contained in the Act of 1950, but with numerous restrictions. These restrictions apply particularly to the powers of the Office of Price Stabilization to establish price ceilings, and of the Federal Reserve Board to control consumer credit. The Congress rejected the Administration's request for power over commercial rents, authority to build and acquire defense plants, power to license firms subject to price ceilings, control over commodity speculation and the right to establish new Government corporations.

Somewhat broadened are the existing powers to provide for subsidy payments on raw or non-processed materials from high-cost sources.

Defense Materials Procurement Agency

Acting on an announcement made August 1, the President on August 28 transmitted his nomination of Jess Larson as Administrator of the newly created Defense Minerals Procurement Agency which is set up directly under Defense Mobilization Director Wilson. The former Administrator of the General Services Administration is well known to the mining industry and carries the approval of the Conference of Western Senators in his new activities.

In announcing creation of the DMPA, the President stated, "The various procurement and development functions presently vested in the General Services Administration, the Department of the Interior, the Economic Cooperation Administration, and the Defense Production Administration will be transferred to the Defense Minerals Procurement Agency. . . . Under the new arrangements there will be retained in the Department of the Interior—in the metals and minerals field—the regular statutory responsibilities of the Bureau of Mines and the Geological Survey, expanded to provide additional services required by the emergency programs."

In officially setting up the Defense Materials Procurement Agency under his Executive Order 10281, issued August 28 and effective when Jess Larson enters upon office as Administrator, the President grant sauthority to (1) purchase and make commitments to purchase metals, minerals and other materials, for Government use or resale; (2) encourage the exploration, development and mining of critical and strategic minerals and metals, as authorized by and subject to the provisions of Section 303 of the Act of 1950, as amended; (3) make subsidy payments, to determine the amounts, manner, terms and conditions thereof, and to make findings, as authorized by the provisions of Section 303 (c); (4) exercise the functions conferred by Section 303 (e) with respect to installation of additional equipment, facilities, processes, or improvements to plants, factories, and other industrial facilities owned by U. S., and with respect to the installation of Government-owned equipment in plants, etc., owned by private persons.

The Order specifies that loans for expanding capacity, exploration, development and mining of strategic and critical minerals will continue to be handled by the RFC. In the future this agency will determine terms and conditions of these loans. In the past these determinations have been made by the various production agencies.

Where loans are made for expanding capacity, certificates of essentiality from the Defense Production Administrator will be required. However, the certificates are no longer to be required for loans involving working capital only.

Transportation

Freight increases of from 6 to 9 percent were granted August 8 by the ICC, effective on 15 days' notice. The new rates supersede the increases of March 12, amounting to 4 percent in eastern territory and 2 percent over the rest of the country.

The new increases in the form of surcharges amount to 9 percent east of the Mississippi and north of the Ohio and Potomac Rivers and 6 percent in southern and western territory as well as interterritorially between all three.

On anthracite and bituminous coal and coke the increase is 6 percent to, from and within all territories, subject to a maximum of 20 cents per net ton or 22 cents per gross ton. Rates on lignite coal, or lignite coal briquettes may be increased 3 percent, with a maximum of 10 cents per net ton or 11 cents per gross ton.

Iron ore rates may be increased 6 percent to, from, and within all territories. Increases on phosphate rock are subject to a maximum of 20 cents per net ton or 22 cents per gross ton; on potash, a maximum of 50 cents per net ton or 56 cents per gross ton.

Authority to maintain the increases expires February 28, 1953, unless sooner modified or terminated. Provision is also made in the order for similar increases in rates charged by domestic water carriers.

The freight absorption bill, S. 719, introduced by Senator McCarran of Nevada is now in the House Committee on Judiciary following Senate passage on August 2. As discussed in the August JOURNAL, the measure will permit sellers to absorb freight charges when done in good faith to meet competition.

It is anticipated that the House Committee will consider action on the bill after September 12, when the members return from their recess.

SEC Investigation

Public hearings are scheduled by the House Interstate and Foreign Commerce Committee in an investigation of the Securities and Exchange Commission and its administration of the Securities Exchange Act.

Representative Heller (Dem., N.Y.), Chairman of the House Subcommittee, has stated that his purpose is to give everyone who wants to be heard a fair opportunity to state his case, and that the inquiry hopes to develop whether the SEC has acted beneficially and wisely. This is the first congressional investigation which has ever inquired into the Commission's administration of the law.

AMC Personals

At a recent meeting of the Arizona Small Mine Operators Association in Phoenix, **Edwin W. Mills**, mining engineer of Salome, Ariz., was elected president to succeed the late J. S. (Sam) Coupal. Mills, who has had extensive mining experience in China, Korea, California and Arizona.

A. L. Lynn, vice-president of Island Creek Coal Co., has been named chairman of the Natural Resources Committee of the Chamber of Commerce of the United States.

Kennecott Copper Corp. has announced that **Stanley Hughes**, designer of the new Utah Refinery at Garfield, is now assistant to the general manager, western mining divisions—smelting and refining operations.

The following promotions have been announced at Kennecott's Utah Copper Division: **A. G. Johnson**, to chief metallurgical engineer, succeeding the late T. A. Janney; **Neil Plummer** to metallurgical engineer at the Arthur plant; and **A. C. Carman** to general mill foreman at Magna.

Howard E. Lohmann, treasurer of the Ayrshire Collieries Corp., Indianapolis, Ind., has been made a director of the Indianapolis Control of the Controllers Institute.

At the annual meeting of the organization's Twin Cities Control, **A. E. Ahlberg**, controller of the North Western-Hanna Fuel Co., St. Paul, Minn., was reelected a director.

Dr. **Charles W. Carlston** has been appointed to a post as United Nations geologist and engineer. He is to spend the next year in Pakistan.

George M. Humphrey, president of the M. A. Hanna Co., Cleveland, has announced the retirement of **Earl E. Hunner**, after 34 years of service with the company. Hunner started as assistant general manager of the Lake Superior operations in 1917, and advanced to general manager, which position he held until 1946. Since then he has been executive consultant. Hunner spent over 50 years in the iron mining industry, joining Oliver Mining Co. in 1901. His earlier experience included field work for the U. S. Geological Survey, railroad location survey, and lode gold mining. He contributed greatly to the iron ore mining industry, and under his management many new methods of mining were adopted.

Herbert E. Jones, Jr., has been appointed vice-president in charge of operations for Amherst Coal Co., Logan County Coal Corp. and the Hatfield-Campbell Creek Coal Co. Jones succeeds the late W. W. Beddow and will have offices in Lundale, W. Va.

Dr. **Curtis L. Wilson**, Dean of Missouri School of Mines and Metallurgy at Rolla, Mo., has been granted the Community Service Award of the Rolla Chamber of Commerce.

The Community Service Award is made by the Chamber of Commerce from time to time to those citizens of

Dr. Wilson (left) receives award from Maurice E. Suhre, president, Rolla Concrete Materials Co.

Rolla who have made outstanding contributions to the welfare of the community without personal gain. Dean Wilson's was the sixth award that has been made during the past 15 years. The award was in the form of a plaque.

Davis Read, consulting engineer, is opening a new office at 120 S. LaSalle St., Chicago. He was formerly chief engineer in charge of operating and related production matters for West Kentucky Coal Co. Following his long operating experience, Read has been actively engaged in the consulting field for the past year.

Election of **J. L. Christian** as a vice-president of Monsanto Chemical Co. was announced by Charles Allen Thomas, president. A native of Alabama, Christian has been general manager of the company's Phosphate Division since 1948.

Pierce Management, Inc., Scranton, Pa., has been selected by the Government of Burma to make a complete coal and mineral survey of that country. The engagement is for two years and five Pierce engineers are assigned to the work which started August 27. **James H. Pierce**, formerly in the Philippines, has gone to Burma to organize the work and will then visit their large construction project in Greece and mines in Portugal before returning home in October.

The Pierce firm is associated with Knappen, Tippetts and Abbett and Robert Nathan Associates in a complete economic, industrial and mining survey of that country.

Henry L. Day, president of Day Mines, Inc., has been elected president of the Idaho Mining Association; **J. E. Berg**, general manager of the Federal Co., vice-president; and **Harry W. Marsh**, secretary. **R. M. Hardy, Jr.**, Kellogg; **J. G. Miller**, Pocatello; **E. E. Coleman**, Stibnite; and **E. B. Douglas**, Cobalt, were elected as the executive committee. The Idaho Mining Association is active in local and national affairs as they affect the mining industry.

It was recently announced that **Sam Haulings** has been made the new mine foreman at the Westland mine of Pittsburgh Coal Co., Division of Pittsburgh Consolidation Coal Co.

Charles E. Tonry has resigned from Southwestern Engineering Co. to accept a staff position with the U. S. Bureau of Mines at the Oil Shale Demonstration Plant at Rifle, Colo.

Recently appointed director of personnel of Reserve Mining Co., **Daniel S. Wilkin** has taken up his new duties at the company headquarters in Cleveland.

E. J. Longyear Co., Minneapolis, Minn., announces two changes which became effective July 1, 1951, in the Company organization.

Mayer G. Hansen, geologist and mining engineer, has been transferred from the Sales Division to the Mining Division, which is expanding its services as mining and geological consultants, and in mine contracting work.

L. R. Louis has been appointed sales manager with headquarters at the offices of the Company in Minneapolis. Mr. Louis comes to the Longyear staff with a background as sales executive in engineering equipment. He was formerly New York District Sales

Manager of the Fabricating and Equipment Division of General American Transportation Corp., Chicago, Ill.

William Wallace Mein, Jr., has been elected president of the Calaveras Cement Co., San Francisco. Mein replaces his father, William Wallace Mein, who was named chairman of the board. **H. C. Maginn** was elected executive vice-president, and **Albert A. Hoffman** vice-president at the same time.

James Reilly, vice-president of Hanna Coal Co., Division of Pittsburgh Consolidation Coal Co., has announced the appointment of **Evan Adams** as Superintendent of Piney Fork No. 1 Mine at Piney Fork, Ohio.

Adams succeeds **Norman C. Prudent** who resigned to accept a position as superintendent of a potash mine of the Southwest Potash Corp., located near Carlsbad, N. M.

Beginning his work with Hanna as a production engineer five years ago, Prudent was elevated to the position of superintendent two years ago. He has been associated with the coal industry for 33 years.

Evans Adams

Norman Prudent

A. W. Witherspoon of Spokane was recently elected president and general manager of the Hecla and Polaris Mining Cos., in the Coeur d'Alene district of Idaho. He succeeds **L. E. Hanley** who recently retired as president and general manager of Hecla Mining Co., ending a career of more than 47 years with that company. Hanley was reelected to the board of directors and was named to the newly created positions of chairman of the board and chairman of the executive committee by Hecla stockholders.

It was announced recently by E. R. Oliver, vice-president, Southern Railway System, that **John E. Pendleton** will be general coal development agent, with headquarters at Knoxville, Tenn.

H. Danforth Starr was elected to fill the newly created office of vice-president of the Cerro de Pasco Copper Corp. Mr. Starr, assistant to the president since February 1949, will supervise the financial and accounting functions of the corporation.

—*Obituaries*—

Professor **A. Copeland Callen**, 63, head of the department of mining engineering at Lehigh University, died suddenly of a heart attack on July 30. A native of Pen Argyl, Pa., Prof. Callen was graduated from Lehigh University with a degree in mining in 1909. He was awarded a master's degree there in 1911.

After three years in industry he went to the University of Illinois as an instructor of mining engineering, and rose to associate professor before going to the University of West Virginia as professor of mining engineering and director of mining extension courses in 1917. Seven years later he returned to the University of Illinois as professor and head of the mining engineering department.

In 1939 Prof. Callen returned to Lehigh as professor of mining and dean of the College of Engineering. His activities were not limited to teaching. He served on the Federal Board for Vocational Education after World War I; was president of the West Virginia Mining Institute in 1923 and of the Illinois Mining Institute in 1930.

During World War II Prof. Callen served as educational advisor for the Army Specialized Training Program in the Third Service Command. He was also active in civic affairs and was a past president of the International Kiwanis and continued active after his term of office. He also took an active interest in the American Society of Engineering Education and belonged to numerous professional and fraternal societies.

Prof. Callen, the man, is gone but he will live on in the work of the hundreds of students who have gone from his classes into the mining industry all over the world.

James Addison Janney, 63, chief metallurgical engineer of the Kennecott Copper Corp, Utah Copper Division, died recently in Garfield, Utah. He started with Kennecott in 1908 and has been with them ever since except for a few years at school.

Lee Bailey Carroll, 60, mining executive of Washington State, died after a long illness this August in a Seattle hospital. He had been a resident of Anacortes, Wash., since 1913, the year he was graduated from the University of Washington, and had been an executive with the Kaaba-Texas Silver Mines at Nighthawk, Okanogan County, Wash., since 1930. While in college, Mr. Carroll and his twin brother, Jason, were both noted for their work on the freshmen and varsity crews.

Pioneer Alabama coal operator, **George Frederick Peter**, recently passed away in Birmingham, Ala., at the age of 82. He organized the Climax Coal Co. of that city in 1895 and the Southern Coal and Coke Co. in 1898. Until his retirement in 1944, Mr. Peter maintained active direction of the two companies.

Senior vice-president and a director of Texas Gulf Sulphur Co., **Wilbur Judson**, 71, died in the Presbyterian Hospital, New York recently. A resident of Newgulf, Tex., he was born in Lansing, Mich. He studied at Northwestern University, the University of Michigan, Harvard, and the Michigan College of Mines. Five years after joining Texas Gulf Sulphur Co., in 1921, he became a vice-president and director. He was also director and a vice-president of Sulphur Export Co. and a director of Mesabi Iron Ore Corp.

C. S. J. Trench, since 1929 editor and publisher of *American Metal Market*, and for fifty years active in the tin trade and metals industry, died recently at his home on Staten Island following an illness of several months.

Mr. Trench was in his seventy-first year. He was born in New York on October 11, 1880. He was educated at Fay School, Southboro, Mass. and Ridley College School at St. Catharine's, Ontario, Canada. After a brief interlude in banking, he joined the organization of Stewart Trench & Co., jobbers in tin plate and metals.

In 1901 he became associated with the firm of C. S. Trench & Co., metal brokers, which firm was established by his father in 1881, and following his father's death in 1929, he served continuously as president of the company, reorganized as C. S. Trench & Co., Inc. From 1902 he was an editorial and market news contributor to the *American Metal Market* and succeeded his father as president and publisher in 1929. He continued to hold these offices throughout the remainder of his life.

William Wilkes Beddow, 59, prominent Logan County, W. Va. coal executive was fatally stricken recently as he boarded a plane for Washington.

Mr. Beddow was one of the pioneer mining men in Logan County and is sorely missed by his friends and associates.

Investigate Uranium Recovery

American Cyanamid Co. has signed two non-profit contracts with the Atomic Energy Commission, one calling for extensive research to find new ways of recovering uranium from various ores and the other for operation of a plant to recover nuclear fuel from used reactor fuel elements.

Dr. R. C. Swain, vice-president in charge of the company's research and development, and director of its recently-organized Atomic Energy Division, set up to coordinate all the company's activities for the AEC, announced signing of the contracts.

Under terms of the contract for research on uranium recovery, Cyanamid is operating a Mineral Dressing Laboratory at Watertown, Mass. In addition to conducting research to find new ways to recover uranium, the Laboratory will assist existing processing plants in improving their recovery techniques. Some 60 persons are already employed on the project and the company expects the number to rise considerably by the end of the year.

Under terms of the other contract, the company will operate a chemical processing plant at the AEC's reactor testing station near Idaho Falls, Idaho, to recover nuclear fuel from used reactor fuel elements. American Cyanamid opened an office in Idaho Falls July 1. About 70 percent of the staff, now being recruited, will be scientists and technicians. A large group of supervisory personnel already is in training for the project at other AEC locations.

Recovery process and plant design were developed by Oak Ridge National Laboratory of Oak Ridge, Tenn., and architect-engineering contract was awarded to Foster Wheeler Corp., New York City.

The Laboratory, begun in 1946, was operated by MIT under direction of Professor A. M. Gaudin. It has been operated by Cyanamid since March, 1951, under a contract with AEC to which the present agreement is an extension.

New Coal Powered Generator

Scranton Electric Co.'s new $10,000,000 generator to be installed at Harding, Pa. will use pulverized anthracite as fuel, it was recently announced. The 40,000 kw generator, expected to be in operation in 1953, will increase the capacity of the station to 130,000 kw.

Alabama Mines Closed

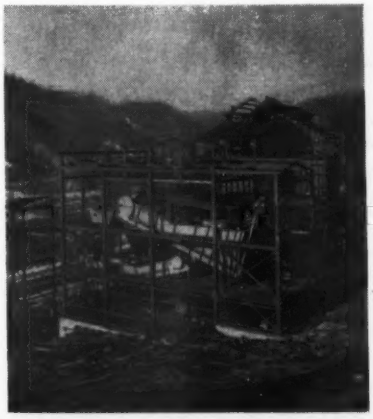
Six Alabama coal mines have been reported closed during the first half of this year according to the Alabama State Department of Industrial Relations.

These were Samoset mine of Alabama By-Products Corp., with a 1950 production of 66,595 tons; Summit mine of the Alta Coal Division of Southern Cotton Oil Co., 26,352 tons; Lindbergh mine of Brookside-Pratt Mining Co., 180,192 tons; Hill's Creek mine of Superior Coal Mining Co., 56,551 tons; Lewisburgh mine of Sloss-Sheffield Steel & Iron Co., 193,805 tons; and the Marigold mine of Marigold Coal Mining Co., a stripping operation with an undisclosed production.

Thin seams, production costs and competitive fuels are largely blamed for the situation.

To Hold Fuels Conference

On Thursday and Friday, October 11-12, 1951, the Coal Division of AIME and the Fuels Division of ASME will hold their 14th joint fuels conference at the Roanoke Hotel, Roanoke, Va. There will be four technical sessions dealing with various



Installation of a 200 tph Heavy Media Separation Plant has just been completed at Rawl, W. Va., for the Crystal Block Coal and Coke Co. Of particular interest in this installation is the fact that a marketable middling product is produced in one vessel and in one pass. The Company is mining coal from the Pond Creek or No. 2 gas seam, which for years has given trouble to coal cleaning people.

George A. Roos (right), vice-president, Philadelphia and Reading Coal and Iron Co., presents Employe Service Pin to Nicholas F. Hoffman, who was pensioned by the company on March 1 after completing 70 years' employment as a P and R employe and was the guest of honor at the company's Annual First Aid Meet at Lakewood Park, near Pottsville, Pa. He also received a Joseph A. Holmes Safety Association Certificate of Achievement for having worked 70 years in the anthracite industry without a lost-time accident.

The pin presented to Hoffman, inaugurated P and R's Employe Service Award Program. Pins in various brackets were given to 4864 employes having had 10 or more years of service.

Hoffman will be 81 years old next December 24. Prior to his retirement, he was master mechanic at P and R's Mahanoy City Colliery.

problems in the preparation and utilization of coal.

Alfred R. Mumford will be presented the Percy Nicholls Award for 1951 at a banquet Thursday evening. Guest speaker at the banquet will be Dr. Walter S. Newman, president, Virginia Polytechnic Institute.

Crean Hill Mine Revived

An important feature of International Nickel's exploration program in the Sudbury area of Northern Ontario is at the Crean Hill mine, which has been shut down since 1919. The mine is being de-watered and the shaft reconditioned, after which comprehensive exploration will be carried out to determine its ore possibilities under modern mining methods.

Acid Drainage Studied

Mellon Institute of Industrial Research has recently published a report on a pilot-plant study of the "Neutralization of Acid Drainage from Bituminous Coal Mines." The study was made under an industrial fellowship of the Sanitary Water Board, Commonwealth of Pennsylvania.

According to the report, neutralization of acid mine waters at the mine does not appear feasible. Although acid mine drainage can be chemically treated with lime or other alkalis to neutralize the acid, such a method is not practical because of economic difficulties involved, the report shows.

Free copies of the pamphlet are available to anyone interested. Requests should be addressed to the Mellon Institute of Industrial Research, University of Pittsburgh, Pittsburgh, Pa.

Battelle to Establish European Branch

Battelle Institute, world's largest independent industrial research foundation, will establish a European branch of its laboratories to serve the European economy, it was announced recently.

According to Battelle director Clyde Williams, the decision follows a recently completed survey of scientific and industrial conditions in Europe.

Since 1929 Battelle, at its laboratories in Columbus, Ohio, has served American industry through science and technology. It plans now to serve European industry in the same way.

Exact location of the European branch and other details will depend upon the outcome of negotiations now in progress. It is anticipated that the new service will be in operation early next year.

Foresee Coal Pipelines

A recent investigation of the U.S.B.M. and the signing of a bill in Ohio giving pipelines for the transportation of coal public-utility status (MINING CONGRESS JOURNAL, July 1951, p. 63) indicates that it may not be too long before coal will be pumped to market.

The U.S.B.M. investigation points out that several manufacturers of centrifugal sand pumps feel that coal can be economically transported by pipeline, provided adequate design and performance data could be obtained from laboratory and large-scale tests. One such test by Pittsburgh Consolidation Coal Co. is now getting under way at Cadiz, Ohio, with a 12-in. pipeline, 17,000 ft long.

It is estimated by the Bureau that it would cost $10,000,000 to build a 100-mile pipeline capable of handling 5000 tons of coal a day. Transportation costs are estimated as being between $1.28 and $1.91 per ton for the 100-mile journey. These estimates are based entirely on a preliminary study of known factors, the report points out.

Similar construction and operating cost estimates are given in the report for the same length pipeline moving tonnages of up to 36,000 tons a day. Construction costs for the larger pipe-

It's faster, low cost drilling here . . .

Tungsten carbide Rok-Bits: 4-Point, Cross Bit or 2-Point Chisel Bit—gauge sizes, 1⅜" to 4".

but this makes the difference

It's Rok-Bit's square threads that assure a tight, trouble-free connection for the bit's long life. They cushion and absorb the destructive forces which frequently cause premature failure in conventional bits. New, free 16-page booklet on use and care of carbide bits available—WRITE! Rock Bit Sales & Service Co., 2514 E. Cumberland St., Philadelphia 25, Penna. *Branch:* 350 Depot St., Asheville, N. C.

ROCKBIT
SALES AND SERVICE CO.

CARBIDE ROK-BITS • INTRA-SET DRILL STEEL • ALL TYPES OF HOLLOW DRILL STEEL • MOIL POINTS • ASPHALT CUTTERS • SABUR POINTS, etc.

lines rise, but transportation costs go down. For instance, the estimated cost of moving coal through 100 miles of the 36,000-on-a-day line is only 38 to 95 cents per ton.

A free copy of Report of Investigations 4799, "Study on the Hydraulic Transportation of Coal," may be obtained by writing to the Publications Distribution Section, Bureau of Mines, 4800 Forbes St., Pittsburgh 13, Pa.

Discuss Stream Clarification

Representatives of the coal industry met with the Ohio Valley Water Sanitation Commission in Cincinnati, Ohio to discuss cooperation in the over-all program to clear up streams in the Ohio River watershed. This Commission was created by an act of Congress authorizing all states in the Ohio River basin to enter into a compact for united action for stream clarification. In June 1938 eight states formally adopted the compact—Illinois, Indiana, Kentucky, New York, Ohio, Pennsylvania, Virginia and West Virginia.

At the meeting on July 26 there were 24 coal operators, representing coal associations from six states—Pennsylvania, Ohio, West Virginia, Kentucky, Virginia and Indiana. Several members of the Commission were present during the morning session and there was evidenced a mutual desire to arrive at satisfactory solutions to this important problem. Other industries, such as steel, chemical, pulp and paper have already organized and have made some progress.

It was brought out at the meeting that the coal industry must tell its own story, especially since a blanket standard would not be effective. This is especially true regarding the extremely difficult question of acid mine water drainage discharged from mining operations. However, the problem has been recognized and scientific studies are being carried on at a number of universities and research institutions. Much has already been done by individual coal companies toward the removal of suspended solids in water but further field experiments and laboratory tests should be continued. To direct these activities and to disseminate information gathered in such studies, it was decided to set up

J. W. WOOMER & ASSOCIATES

Consulting Mining Engineers

Modern Mining Systems and Designs
Foreign and Domestic Mining Reports

UNION TRUST BLDG.
Pittsburgh, Penna.

NATIONAL BANK BLDG.
Wheeling, W. Va.

Cut Haulage Costs

WHEN EDISON Nickel-Iron-Alkaline Storage Batteries power your mine-haulage equipment, they help you cut costs in several ways. Their unequaled dependability gives the closest approach to failure-free, uninterrupted haulage it is possible to obtain. That's because their all-steel cell construction withstands rough usage; their alkaline electrolyte is a preservative of steel; their electrochemical principle of operation is free from self-destructive reactions.

They do not require critical adjustment of charge rates — can often be charged direct from the d-c power supply. They can be fully recharged in six to seven hours, which helps get all charging done during off-peak periods.

Get a current price quotation—you will probably find initial cost lower than you think. Couple this factor with well-known Edison long life and you will have the key to year-after-year economy. Edison Storage Battery Division of Thomas A. Edison, Incorporated, West Orange, N. J. Thomas A. Edison of Canada, Limited, Montreal.

YOU CAN ALWAYS RELY ON

EDISON

Nickel • Iron • Alkaline

STORAGE BATTERIES

For rugged, 3-shift service . . . specify LINK-BELT Cast Buckets

YOU get extra dividends in longer life with Link-Belt Cast Buckets —

- Abrasion, corrosion and tough usage meet their match in top-grade Link-Belt malleable iron or Promal (the stronger, longer-wearing metal).
- Friction and wear are minimized by smooth, seamless surface.
- Corners are reinforced for added strength.

Equally important, accurate balance and advanced design give you the proper filling . . . clean discharge.

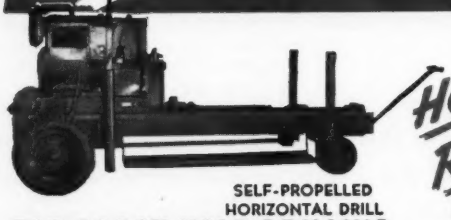
Link-Belt builds all sizes in six different styles . . . for either chain or belt mounting. Complete L-B line also includes steel buckets of various designs. The next time you replace your elevator buckets, call your Link-Belt representative for all the facts.

LINK-BELT

CAST ELEVATOR BUCKETS

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices, Factory Branch Stores and Distributors in principal cities. 12,518

McCarthy Drills PAY OFF!



SELF-PROPELLED HORIZONTAL DRILL

FOR BLAST HOLE DRILLING

● Heavy all welded steel carriage and four individually adjustable leveling jacks make setups faster, drilling smoother. Finger-tip hydraulic control permits instantaneous change of drilling feed. Bores 5 to 10-inch diameter blast holes to horizontal depths of 120 ft. or more.

Heavy-Rugged

- ✓ McCARTHY DRILLS PAY THEIR WAY
- ✓ MAKE MORE MONEY FOR YOU
- ✓ RECORDS SHOW 40% MORE HOLES
- ✓ LIST OF USERS ON REQUEST

● McCarthy Vertical Drills adapt to any job where ordinary rock formations are to be blasted.

Designed with compact retractable hydraulic tower for Truck, "Cat," Half-track or Jumbo mountings. Power shafts made of tough alloy steel. Simplified construction throughout.

Over-all height with tower reclining: 7 ft., 4 in. Wt.: 5,100 lbs. All McCarthy units can be operated with Gasoline, Diesel or Electric power units. Write for descriptive literature.

Powerful

VERTICAL DRILL

FIFTY YEARS DRILLING EXPERIENCE 1901-1951

SALEM

THE SALEM TOOL COMPANY

SALEM

Lively, New Nickel Town

A BRAND new community is in the making in Northern Ontario, Canada. Located on a rolling plain, the village will have neat modern houses, a large public school, stores, and other facilities so necessary to modern living. It's the town of "Lively," named after a veteran employe of The International Nickel Co. of Canada, Ltd., the company responsible for the creation of the town.

Located in the Sudbury district, in the midst of the world's largest known nickel deposits, Lively will help to carry out a major change in International Nickel's mining operations. During the past 10 years, Inco has been engaged in a continuing program of extending its regular underground operations at Creighton, Garson, Levack, and Frood mines, and, in addition, new underground mines are being brought into production at Stobie, Murray, and Creighton. This expansion will offset tonnages presently obtained from the company's great open pits where operations are scheduled to be completed about 1953.

within the coal industry an "advisory committee." This will consist of two representatives from each of the six states represented at the meeting. E. R. Price, Inland Steel Co., was elected committee chairman, with two vice chairmen—John J. Foster, Island Creek Coal Co. and Robert T. Laing, Central Pennsylvania Coal Production Association. Henry F. Hebley, Pittsburgh Consolidation Coal Co., was elected secretary.

Kennecott Moves Offices

Kennecott Copper Corp. is preparing to move its New York offices, before the end of the year, to the new 32-story air-conditioned Chrysler Building East, companion structure to the original 77-story Chrysler Building.

Kennecott has extensive mining and milling operations in Utah, Nevada, Arizona and New Mexico; smelters in Nevada and New Mexico, and a recently completed electrolytic refinery in Utah. Braden Copper Co., a subsidiary, owns and operates large copper properties in Chile.

One of the country's largest producers of gold, silver and molybdenum, Kennecott also has mining interests in Canada and South Africa. Through its wholly owned subsidiaries, the company produces copper and brass products. Its principal fabricating subsidiaries are Chase Brass & Copper Co., Inc. and Kennecott Wire and Cable Co.

The first firm in its field to move to the midtown area from lower New York, Kennecott Copper has occupied offices at 120 Broadway since its organization in 1915.

Coal Retailers Visit Operators

The West Kentucky division of Bell and Zoller Coal and Mining Co. was recently visited by approximately 100 members of the Chicago Coal Merchants Association. Visitors were shown 11 coal mines in the Madisonville, Ky., area and were guests of a group of operators at a barbecue held at the Madisonville Country Club.

Look for Mine Timbers

A delegation headed by Mr. Parlongue, representing the Office Central d'Approvisionnments, Charbonnages Belges (Belgian Central Coal Supply Office) has been in the United States for the express purpose of making contracts to purchase mine timbers in the southeastern States. According to an ECA memo in May, this delegation was to come to this country if assured of available supplies meeting requirements. It was stated at that time that 150,000-200,000 cubic meters (65-85,000,000 board ft.) of mine timbers were wanted.

RECLAIM YOUR SLURRY !

To go "all out" for COAL Production, reclaim your SLURRY Coal—No other means will accomplish this more economically than a C·M·I CENTRIFUGAL COAL DRYER !

C·M·I Centrifugal DRYERS

Write or Wire! Let us tell you all about it.
No obligation, of course.

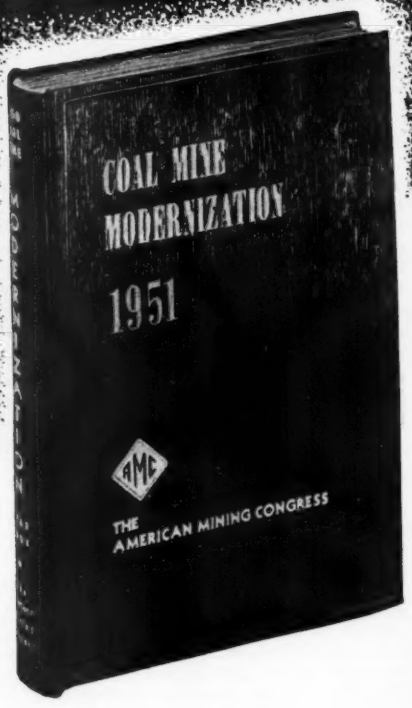
CENTRIFUGAL & MECHANICAL INDUSTRIES
146 President St., St. Louis 18, Mo.

Here's the "HOW" and "WHY"—

of Successful...

Coal Mine MODERNIZATION

—Just O...



HERE'S a complete review of progress in every phase of coal mining by the nation's leading executives, engineers and operating officials —all the proceedings of the 1951 Coal Convention.

Coal Mine Modernization gives you hundreds of valuable ideas on methods and equipment that you can put to work right away for low-cost, safe and efficient coal production and preparation.

All this up-to-the-minute coal mining "know-how" is yours in this easy-to-use practical book —for less than 1c a day.

Loaded with the latest dope on continuous mining, roof support, mechanical mining, maintenance methods, safety, coal preparation, strip mining, public relations, etc.

ORDER YOURS TODAY!

PUBLISHED BY

AMERICAN MINING CONGRESS

RING BUILDING • WASHINGTON 6, D. C.

$3.00 PER COPY

Special quantity rate. 10 or more copies—$2.75 each

Central States

Sulphur Supply To Increase

Discovery of a new sulphur deposit, expected to be a major factor in solving the current world shortage of the mineral, has been announced by Freeport Sulphur Co.

Located on Garden Island Bay in the marshes of the lower Mississippi River delta and 100 miles southeast of New Orleans, La., the deposit is native sulphur, or brimstone, which is the cheapest and purest of the various forms of the element. The deposit occurs in a typical salt dome formation and was discovered by the Texas Co. when exploring for oil. Freeport obtained the sulphur rights early in 1951 and under its lease will pay Texas Co. 50 percent of the profits derived from the operation.

John Hay Whitney, chairman of the board of directors, and Langbourne M. Williams, Jr., president of Freeport, have said that a mining plant will be constructed with the objective of producing 500,000 long tons of sulphur a year. It is estimated that the plant will cost between $10,000,000 and $15,000,000.

The mine, the largest single sulphur development in the world in nearly 20 years, is expected to be ready for operation in 1953.

Cleveland-Cliffs Establishes New Department

Edward B. Greene, chairman of the board of The Cleveland-Cliffs Iron Co., has announced that his company has established a Department of Publicity and Public Relations and that R. L. Kirkwood will be fully responsible for the operation of that program on behalf of management.

In additional promotions at the Cleveland office, James D. Condon, who has been in the purchasing department, will now devote his time to office management functions as assistant to office manager. R. H. Sheppard and C. C. Knight were made assistant purchasing agents, reporting to H. C. Shade, general purchasing agent at Cleveland.

An announcement has also been made of the appointment of Stanly W. Sundeen of Ishpeming, Mich., to the newly created position of assistant manager under C. W. Allen, general manager of Michigan Mines. Sundeen will be in charge of a special program on investigation, development, and research of new properties with headquarters in Ishpeming. He has been with Cleveland-Cliffs since 1936 as a geologist and as superintendent of the Cliffs Shaft Mine.

Changes in mine personnel have also been made. Onnie Marjama, superintendent of the Spies Mine, will be relieved of his duties at Spies and will be superintendent of the Cliffs Shaft and Lloyd Mines. T. A. Kaupilla, former mining captain at the Spies Mine and recently promoted to assistant superintendent, will be in charge of the Spies Mine operation.

Open Research Lab

The lignite research laboratory at Grand Forks, N. D., will be dedicated September 29, by Secretary of the Interior Chapman and named for the late Representative Charles R. Robertson of North Dakota. Senator Langer, who proposed the action, will accompany Chapman when he goes to Grand Forks for the dedication in September. Senator Young will also attend.

Stewart, Aspoas Property

William Stewart, mining engineer, and Henry Aspoas, dealer in mining supplies, have secured a first lease on 400 acres in Ottawa County, Okla. The tract is immediately west of the Eagle Picher central mill. It has been subleased to four mining companies who are drilling and developing on their respective tracts.

Eighty acres in the northeast corner of the tract have been leased to Silas Kenney, Henry Hartzell, and Pete Gibson, all experienced mine operators. Drill holes 165-197 ft deep have tapped ore deposits averaging 25 ft in thickness.

A 60-acre lease, on which was the Roanoke mine and mill, has been leased to the three Gregory brothers and Walter Leton. Drill holes on this tract are 165-186 ft deep and outline an ore body 24 ft thick. There is also an upper deposit of ore 154-185 ft deep.

The George E. Huff Mining Co. has leased the Smokey Hill tract, where there formerly was a mine and mill. It is the east half of the southwest quarter and contains 55 acres. Old holes show lead and zinc ore on the 280-310 ft levels. The company is

A view of the Morton mine shaft at Hibbing, Minn., after stripping operations had exposed the top 40 ft and before the concrete lining was blasted away. The demolition job was complicated by the fact that the rest of the shaft had to be protected, as it is to be used in dewatering the underground mine. The job was successfully completed under the supervision of Milton Englund, head mine foreman of the M. A. Hanna Ore Co.

Rehabilitate Stripped Land

Little Sister Coal Corp., owner of twelve square miles of coal-bearing property in Fulton County, Ill., is attracting national interest with a land reclamation program that is converting its badlands into a veritable breadbasket.

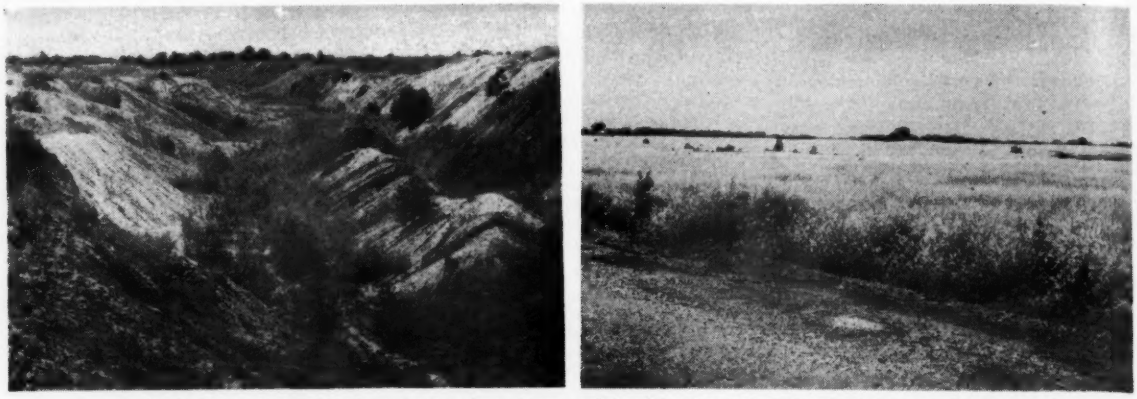
Spoil piles on 4550 acres of Central Illinois land are being bulldozed level by diesel-powered crawler tractors in a nonstop operation. After the spoil piles are leveled, the land is treated with commercial fertilizers before being seeded with grain and forage crops.

Anxious to reclaim the land that is still being up-ended at the rate of 0.65 acre per day by power shovels with 40-cubic-yard buckets, mine owner William H. Cooke, Chicago, retained the Farm Clinic of the United States, West Lafayette, Ind., to make surveys and analyze the soil for productive properties. Early in 1950 favorable findings were reported by the clinic, and the Little Sister Farms, a subsidiary of the mining company, was set up with Francis J. Platt as manager.

The land, according to the manager of the Little Sister Farms, is now in some cases more productive and easier to farm than before it was stripped. Easier to work, because in some areas it is flatter after being bulldozed than it was in its native state and more productive, after receiving commercial fertilizer, because the stripping and dozing operations mix many crop-stimulating minerals throughout the soil, minerals that originally were out of reach of the plant roots.

Use of a 20-ton TD-24 tractor is typical of the size of the equipment required at this Fulton County mine, now rated a 1,000,000-ton-a-year operation. The No. 5 seam of coal, varying in thickness from 4½ to five ft, is covered by as much as 85 ft of overburden which is stripped by large electric-powered shovels. Coal is hauled to the tipple in a fleet of 19 trucks with carrying capacities ranging from 25 to 35 tons.

While it will take many years for the present equipment to rehabilitate the recoverable acreage on the Little Sister Farms, the first crops will be harvested this season, and next spring more acres of previously "worthless" land will be put under cultivation.



Acres of land, similar to that pictured on the left, have been reclaimed by the Little Sister Coal Corp. in Fulton County, Ill. Left in the wake of strip mining operations the spoil piles are leveled, treated with commercial fertilizers and planted to grain and forage crops. On the right is a view of a 110-acre field of this reclaimed land.

now mining on the 280-ft level and will also mine the 310-ft level.

Claude Holden and associates hold a lease on 80 acres in the southern half of the 400-acre tract. The company is operating a shaft mine and getting good results.

These mines and mills were forced to shut down when the prices of zinc dropped several years ago. The prices presently prevailing justify opening and putting them in operation again.

New Tunnel Advancing Method

A new time-and-cost-saving method for advancing tunnels by peripheral sawing, used successfully for the first time at the Fort Randall Reservoir project at Pickstown, S. D., is described in a U. S. Bureau of Mines publication just released by Secretary of the Interior Oscar L. Chapman.

To advance 12 circular tunnels into chalk formations at the Fort Randall dam project of the Army Engineers on the Missouri River, the Silas Mason Co., contractor, substituted peripheral sawing for peripheral drilling.

The peripheral sawing method made use of a saw mounted on a carriage at the front of a large jumbo to cut a 6-in. kerf around the periphery of each tunnel being advanced. The ring formed was used as the free face for blasting.

Tunnels were excavated to exact dimensions desired with no overbreak. Excellent rock fragmentation was obtained, Walter Lewis, author of the publication and chief of the USBM Minerals Survey Branch at Minneapolis, said.

In comparison to peripheral drilling, Mr. Lewis pointed out that peripheral sawing eliminated the rough surface and to a large extent the fracturing of the tunnel wall, required fewer blast holes to break the round, and less time for every operation.

The publication contains many photographs and four graphs that compare time consumed in the cycle of operations in both peripheral sawing and peripheral drilling.

A free copy of Information Circular 7610, "Tunnel Construction by Peripheral Sawing at the Fort Randall Reservoir, Pickstown, S. D.,", may be obtained from the Publication Section, Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pa.

Sizes and accessories for your individual requirements. Write for information and sample.

BEMIS BRO. BAG CO.

111 No. 4th Street, Box 35, St. Louis, Mo.

Lignite to Power Alcoa Plant

A new aluminum smelting plant, the first in history to use lignite for fuel, will be built by Aluminum Company of America at one of several alternate locations approximately 60 miles south of Waco, Texas. The plant will have a production capacity of 85,000 tons of aluminum annually when completed. Production of metal is expected to start in the early Fall of 1952.

The existence of large deposits of lignite in the Milam County area has been known for years. Use of processed Texas lignite as a major fuel source was proved feasible only recently due to new developments in fuel technology.

Electricity required by the new plant will be generated by steam-driven equipment using processed lignite as fuel. The power generating facilities will be built and operated for Alcoa by the Texas Power and Light Co. Although detailed negotiations have not been completed, the arrangement will provide for an interchange of power between the Alcoa-owned power plant and Texas Power and Light to insure a firm power supply for the aluminum smelter.

Advantages of the Alcoa plant site in Milam County lie not only in the availability of reserves of lignite sufficient to supply fuel needs for many years, but also in the ability of Texas Power and Light Co. to supply interim power sufficient for partial operation of the smelter before completion of the generating plant.

Lignite's great promise as a major source of low-cost power was made possible by the Texas Power and Light Co., which sponsored an extensive research and experimental program, and by the U. S. Bureau of Mines which carried out the project in a pilot plant at Denver, Colo.

Engineering surveys show lignite deposits existing to a depth of several hundred feet on the site of a prehistoric river bed. Both strip and deep mines can be utilized to produce the fuel for the power plant.

Alcoa previously had placed in operation a gas-fueled aluminum reduction plant at Point Comfort, Texas. The Milam County plant will add another major link to Alcoa's chain of interests in the State of Texas, and an important addition to the growth of the aluminum industry as a whole in this section of the country.

Currently, the Point Comfort plant is being enlarged to produce an additional 35,000 tons annually. Also under construction is a new 85,000-ton smelting plant at Wenatchee, Wash., and a new plant at Bauxite, Ark., for the refining of bauxite ore into alumina (aluminum oxide).

Sale of Permits High

Minnesota has had the largest sale of iron ore prospecting permits in its history. On August 13 in St. Paul the state executive council examined 175 offers to prospect for millions of tons of commercial ore in mines on the Mesabi, Vermillion, Cuyuna and Gun Flint ranges. The previous record was set in 1948 when 130 bids were made.

Twenty-six bids, the highest number by any one firm, were submitted by the Oliver Iron Mining Co. Next high was the Cleveland-Cliffs Iron Co. of Hibbing with 24, and the W. S. Moore Co. of Duluth, 22.

Two mines having more than 2,300,000 tons of ore were among the properties up for lease. One location, near Keewatin, Minn., has known deposits of 320,000 tons of open pit crude wash ore, and the other, also near Keewatin, has 2,000,000 tons of deep mine ore plus some of the open pit type, according to director of state lands, Ray D. Nolan.

Parmanco
HI-SPEED HORIZONTAL
— DRILLS —

New Traction Drive with Forward and Reverse

Are Delivering

6-INCH SHOT-HOLES

READY FOR LOADING

AT BETTER THAN

A FOOT A MINUTE!

The new Parmanco Hi-Speed Horizontal Drill is completely redesigned around a 40-H.P. engine with four drilling speeds which, in field tests, has cut one-third off the footage drilling time:— a cost-per-drilling-foot saving that we are passing on to the strip mine operator and contractor at no increase in our price. In addition, the drill is equipped with a starter and generator, dual type front wheels, truck type rear axle with mechanical brakes and a traction drive with both forward and reverse.

For BOTH MINES and CONSTRUCTION

•

PARIS MANUFACTURING COMPANY **PARIS, ILLINOIS**

Yerington Open Pit Project

The Anaconda Copper Mining Co. is reported to have asked Federal approval of a multimillion dollar development of its extensive copper holdings near Yerington, Nev., with a guaranteed price by the Government for metal and an escalator clause providing for consideration of a higher price if operating costs go up. It is proposed to equip the mine to develop and mine up to 35,000,000 tons of low grade oxidized copper ore by open pit methods. The ore averages about one percent copper content, based on shaft exploration, churn drilling and diamond drilling.

Properties owned by Anaconda include a large group of claims known as the Guild-Adams group. The deposits were extensively drilled, explored and developed several years ago. A leaching plant is included in the plans.

New Mexico Miners to Meet

Dates for the 1952 annual convention of the New Mexico Miners & Prospectors Association to be held in Carlsbad, N. M., have been announced by president T. M. Cramer.

In order not to conflict with any other mining association meeting the time for the annual convention has been set for January 17-19.

Arrangements are in progress to obtain outstanding speakers for the program and every effort is being made to make the 1952 meeting the most successful of any ever held by the Association, president Cramer said.

Pitchblende Deposit Found

Discovery within 35 miles of Tucson, Ariz., of a deposit of pitchblende, uranium-bearing ore, has been verified by the U. S. Bureau of Mines office there. The ore was discovered by two amateur prospectors, Albert Ybarra and Glenn Allen. Development work is under way to determine the extent of the deposit.

Mining Company Bought

American Smelting and Refining Co. has recently purchased 6200 shares of Federal Mining Co. stock, giving A. S. & R. a 54 percent interest in the company operating the Morning, Page and Frisco mines in the Coeur d'Alene district. At the Morning mine in Mullan, Ida., which has a depth of 4975 ft, the company has started a drift on the 3600 level to prospect the Independence lead group lying between the Morning and Gold Hunter mines.

New Idria Mining Co.

Limited quicksilver production has been resumed by New Idria Mining Co., near Hollister, Calif., idle for the past few years. Two of the four furnaces have been reactivated for treatment of tailings, more than 40 men employed, and preparations made to reopen several of the numerous mine shafts.

Mine officials report the property may be operated at full capacity within a few months if mercury price holds up. Large ore reserves are reported blocked out in main workings and recent exploration is said to have disclosed new deposits in virgin ground. During World War II, New Idria was operated with 250 men and its annual output was valued at more than $2,000,000.

Fire Razes Tipple

Between $25,000 and $30,000 worth of damage was done when fire recently destroyed the tipple at the Osborn coal mine, operated by Louis Coth and George Calovich, 3½ miles southwest of Gebo, Wyo.

New Sulphur Plant

Continental Sulphur and Phosphate Corp. is speeding up preliminary work preparatory to building a $1,750,000 plant for processing sulphur in the Sunlight region near Cody, Wyo. A road is under construction and will be completed soon. A sawmill, light plant, sewage system, kitchen, dining hall and cabins have been completed at the present time.

Processed sulphur is scheduled to start coming into Cody in about a year, Jack Winfrey, executive vice-president of the company, has said. It will be shipped to Lander, where the corporation has phosphate holdings and plans a phosphate plant. Because of the shortage of the material, Continental will start shipping raw sulphur from Cody before the plant is finished. It is estimated that the Sunlight area has from 20,000,000 to 40,000,000 tons of sulphur deposits.

Trout Mill Building Started

The foundation for the new Trout lead, zinc and silver mill was laid early in August at Philipsburg, Mont., by the Trout Mining Division of the American Machine and Metals Co., Inc., according to Leslie B. Manning, superintendent of the company. Old buildings and a large part of the hillside had to be cleared for the new mill, which is being constructed close to the manganese mill now operated by the company.

Installation of machinery will be made as soon as possible. A ball mill which is to be the third unit of the planned three-stage crushing system is already on hand at the mill site.

French Corral Dredge Started

Operation of a dragline dredge handling 300 cu yd of gravel an hour began recently at the old Esperance hydraulic line near French Corral, Calif., leased from Guy Standifer of San Francisco by Winona Mining Co. Water for operation is obtained from San Juan Gold, Inc.

Black Rock Mill Planned

Construction of a new tungsten concentrating plant west of Hilko, Nev., at an approximate cost of $600,000 is planned by Lincoln Mines Division of Black Rock Mining Corp. The mill is designed for treatment of 250 tons of scheelite daily at the Lincoln Mines property, recently acquired by Black Rock. Approximately 60 tons of ore are currently trucked daily to the Pine Creek plant of Union Carbide & Carbon Co., near Bishop, Calif.

Tungsten has been mined at the property for many years, and operations have been accelerated since the mine was acquired by Black Rock, a subsidiary of Wah Chang Corp. of New York.

DAVIS READ
Consulting Engineer
Layout Operation
Modern Production Methods
Plant Design Preparation
Chicago, Ill. 120 S. LaSalle St.
Madisonville, Ky. 235 East Noel Ave.

L. E. YOUNG
Consulting Engineer
Mine Mechanization
Mine Management
Oliver Building Pittsburgh, Pa.

Drainage Tunnel Nears Objective

EXPLORATION and development soon will be possible at deeper levels in the Leadville, Colo., area. The Leadville drainage tunnel recently tapped the main body of water in the long flooded lead-zinc district's honeycomb of abandoned mine workings, and the water level in nearby mine shafts has been receding ever since. On July 5 a peak flow of 3765 gpm was recorded. This has fallen off to about 3200 gpm at the present time. Pictured on the right is the tunnel's portal. The flow of water in the drainage ditch is at the rate of 3600 gpm.

In addition, a lateral has been holed through into the Hayden shaft. being rehabilitated by the Caldwell Mining Co. and pictured on the left—marking the first direct contact between flooded underground workings and the drainage tunnel.

The tunneling crew will now renew its work at the tunnel face, where a sudden influx of water caused suspension of operations. There are only 400 ft to go to reach the current objective, the Robert Emmet shaft. The undertaking is a USBM project.

Lucky Friday Completes Shaft

Lucky Friday Mining Co., near Mullan, Ida., has just completed its main working shaft to the 2000-ft level. On the 1800-ft level the Lucky Friday vein was 8 ft wide and contained silver-lead ore. A crosscut on the 1800-ft level located another vein 75 ft south of the Fridav vein which was 2 ft wide on that level. While driving a raise from the 1800-ft back to the 1600-ft level the company has stockpiled 1500 tons of ore.

Mine Vandalism Reported

An order on July 6 by Roy A. Phillips, Custer National Forest supervisor, closed the Mouat chrome mine site on the upper Stillwater river to all but official visitors. He said that vandalism on the holdings, eight miles above Nye, Mont., forced the order. A permanent guard is stationed at the site.

Apply for DMA Loan

At the annual meeting of the Nabob Mining Co., operating in the Pine Creek area of Idaho, executive officers stated that the company has applied to the Defense Minerals Administration for a government loan of $176,000 for new exploration work through the company's long lower tunnel. The company has drifted 864 ft westerly on the Crystolite vein opening an ore zone some 15 ft wide containing a 2 ft wide streak of zinc ore, a 3 ft wide streak of lead ore and a 10 ft wide zone of lead-silver ore. The company is producing a milling ore from this vein.

With the government loan it is proposed to extend the Crystolite development drift another 600 ft west and from that point diamond drill the ore deposit. Company officials also propose to connect the lower workings on the Denver vein with the upper workings by raising on the vein to where leasers are extracting lead-silver ore 400 ft above. This vein is the westerly extension of the Sidney but has never been thoroughly prospected on the Nabob lower tunnel level.

Silver Peak Mines to Reopen

Reactivation of the Argentine and Nivloc silver-gold-lead mines in the Silver Peak district near Goldfield, Nev., is progressing under the supervision of E. R. Hines, associated with Avery Brundage of Chicago. Hines reports he intends to build a mill at Silver Peak to treat ore from both properties and that mining operations on a substantial basis are planned.

Bellefountaine Busy

Activity is increasing at gold properties of the Willow Valley Mines Co., near Nevada City, Calif., following installation of a compressor, motor, air drills and other units at the Bellefountaine property. A drift, extended from the St. Louis shaft, is expected to reach the Omega vein, which was mined extensively in 1935-36.

Kaiser Tunnel Progresses

Kaiser Steel Corp. has driven more than 1600 ft of its haulage tunnel at Sunnyside Mine No. 1 in Carbon County, Utah. This tunnel, which will eventually be 2000 ft long, is the main feature of the new portal constructed in Sunnyside on the west side of the mountain and is being driven through hard rock from the surface tipple to a coal seam now less than 400 ft distant.

R. G. Heers, mine superintendent, said the haulage way and other improvements in the No. 1 mine were authorized to make more efficient the mining of some 30,000,000 tons of coking coal lying under less than 3000 ft of cover. The new facility will speed movement of miners and materials, eliminate use of the outside slope hoist and increase general hauling capacity from the mine by 2500 tons daily, he said.

Heers also reported that the $440,000 expansion program will include some 8900 ft of haulageway in the mine proper and improvements on the No. 1 slope of the mine.

Renovation will include replacement of some 3600 ft of slope track, replacement of 11 turnouts on hoistway, track grading, and extensive repairs to the ventilation system. Heers believes the improvements, to be completed by the end of this year, will make the former Utah Fuel Co. mine one of the best in the country, "in terms of safety and efficiency."

Structure of East Tintic

(*Continued from page* 61)

based on alteration studies and on churn drill logs, it showed a large thrust fault extending many miles to the north, going under the northern edge of the lava. If this fault is extended south into the region to the south, it passes almost through the Silver Shield mine, but is probably offset at this point. In the Chief Oxide area the USGS hole apparently went into the footwall of this overthrust block under the Tintic quartzite.

This revision in the geology of the East Tintic District is especially interesting because of the alteration related to ore mineralization in a thick section of dolomite and limestone in an area where previously it was believed there was little hope for commercial replacement ore, since it was presumed that inhospitable Tintic quartzite lay directly underneath the lava. Instead, the picture as it now appears indicates that the area is worthy of further investigation by diamond drill and more geological work.

Rising Hope Mine Revived

Rejuvenation of the Rising Hope gold mine near Placerville, Calif., is progressing. Developed by four miles of underground workings, the property covers 217 acres of patented land and produced considerable gold during the 1920's. It is held under lease by Pike and Leroy D. Petterson of San Bernardino.

Operators plan installation of a mill capable of handling 500 tons of ore daily. The property has large ore and gravel deposits, with a copper dike scheduled to be prospected. A conveyor haulage system is to replace the present rail system.

Constructing Canadian Plant

A number of contracts have been awarded by Consolidated Mining & Smelting Co. in connection with its $63,000,000 expansion program.

Excavation work and the dam construction for the Waneto Power Plant will be done by Northern Construction Co. and J. W. Walker. F. A. Tucker, Montreal, is already working on the 87-mile power line from Slocan to Kimberley and the Smelter's Bluebell mine. Several buildings, including a 500-ton concentrator will be built at the Bluebell by Marwell Construction Co., Vancouver.

Explore Halloysite Deposits

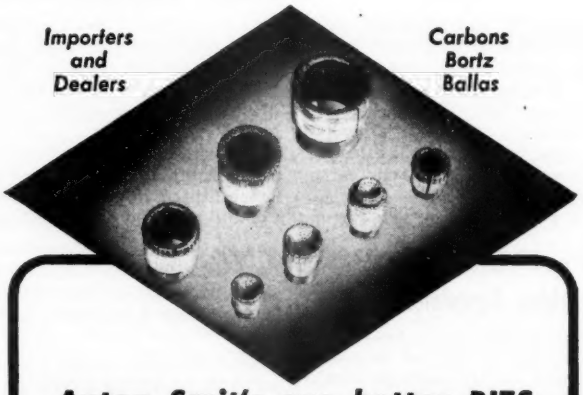
New Park Mining Co. has signed a contract with Filtrol Corp. for the exploration and development of halloysite clay deposits at Park City, Utah. The deposits are in the upper levels of the New Park mine off the Park-Bingham tunnel. Filtrol Corp. utilizes the clay in manufacture of an agent used in the catalytic cracking of oil.

According to Robert L. Cranmer, secretary of New Park, the prospect would be largely exploratory in nature for some time. "We have considerable showings of halloysite clay in the Park-Bingham tunnel," he said, "but the deposits have never been diamond drilled or blocked out so we have no idea of the extent of reserves."

Nevada Iron Project

Production of 1000 tons of iron ore a day is planned from properties in the Lovelock, Nev., area by Mineral Materials Co., of Alhambra, Calif. Installation of equipment has begun and shipping is scheduled to start soon. Ore will be trucked to a new railroad siding five miles from Lovelock for shipment by rail to Pacific Coast markets.

Situated in the Humboldt range, the deposits were diamond drilled during World War II and 4,000,000 tons of



Anton Smit's are better BITS

The DIAMOND BITS of Anton Smit & Co., Inc. are the best bits because:

1. They have been steadily improved over a 20 year period...
2. Using a Tag-And-Report system whereby the history in use of Anton Smit Diamond Bits is traced, known and employed in further perfecting them...
3. Resulting in superior features, such as the Anton Smit powdered metal matrix that insures even wear and diamond economy.
4. The international scope of our business assures the widest selection of industrial diamonds scientifically chosen for specific uses — the best possible diamonds and matrices for every type of formation and usage—at rock bottom economies.

Informative booklets sent free on request.

Est. 1908 **ANTON SMIT & CO., Inc.**

333 W. 52nd St., New York 19, N. Y. Cables: PROFITABLE, New York

Be sure to see our representative at the

AMERICAN MINING CONGRESS,

HOTEL BILTMORE, LOS ANGELES, OCT. 22-24

Sample bits will be on hand for your inspection.

magnetite ore were indicated. Mineral Materials acquired 16 claims in 1941-42 and conducted exploratory and development work during the war. Thirty men will be employed in the operation.

Dredging to Start Soon

The Wyoming Mica and Metals Corp. is setting up a dredge for placer operations in Rock Creek in the Atlantic City, Wyo., district, about a mile north of the old asbestos mine. The firm will dredge for gold, mica and monazite. Company officials say that Denver assays of creek bottom sand in Rock Creek show both gold and mica. The extent of the monazite deposit has not been determined. A camp has been set up with 15 employes. Creek bottom and hillsides will be dredged and the earth carried by belts to washers.

Recondition Old Shaft

Banner Mining Co. has acquired the Mineral Hill group of 38 claims in the Pima mining district of Pima County, Ariz. This property is an old-time producer and is credited with an output of 8,000,000 lb of copper and 50,000 oz of silver from operations conducted between 1898 and 1918.

Preliminary work of retimbering and reconditioning the old shaft is directed by A. B. Bowman, manager, Tucson, Ariz. The project is among those recently receiving DMA approval for a mine exploration grant.

Austin-Jumbo To Grow

Austin-Jumbo Mines, under new management, is planning to expand operations. The company operates the Jumbo gold property in the Awakening district near Winnemucca, Nev., and recently spent $500,000 for development work and additional equipment. Mill capacity has been increased from 500 to 1000 tons a day.

Mill Destroyed by Fire

A recent fire of undetermined origin destroyed the chrome mill erected at Red Lodge, Mont., during World War II by the U. S. Vanadium Corp. Loss was estimated at $20,000.

Jacobson Mine

Development of a vein system, ranging from two to eight ft wide, continues in the Jacobson gold mine in the Garden Valley region near Downieville, Calif., leased last year by Furn Crabtree and Carl Simpson of Kelsey. The Jacobson adjoins the Cincinnati and contains much virgin ground. It comprises 70 acres and is worked through a 260-ft tunnel and shallow shaft.

With the Defense Agencies

(*Continued from page* 63)

and the facilities would be situated in 35 states.

Pricing Orders

The Office of Price Stabilization has exempted from price controls the following strategic and critical metals and minerals: raw asbestos, beryl ores, chrome ores, cobalt ores and metal, columbite-tantalite ores, natural graphite, kyanite and related ores, manganese ores, acid grade fluorspar, and domestic mercury.

The pricing agency on August 9 postponed the filing date for Form 8 indefinitely. This form was required under Ceiling Price Regulation 30 (the machinery pricing order) and under Ceiling Price Regulation 22 (the general manufacturers' order). It was to have been filed by August 13, but because of the terms of the Capehart amendment to the new economic controls law, requiring that ceiling prices reflect both direct and indirect costs of materials and services up through July 26, 1951, the two pricing orders had to be revamped to bring them in line with the new law. The two regulations provided only for the inclusion in price ceilings of direct materials costs up to December 31, 1950, and changes in direct labor costs up to March 15, 1951.

Both regulations are being revised to make them conform to the new law.

CMP Fourth Quarter

The National Production Authority has taken steps to extend the Controlled Materials Plan for scarce materials in the fourth quarter to all segments of the economy. It has ordered producers of steel, copper, and aluminum in the last quarter not to accept unrated orders, and to set aside most of their production to meet CMP needs. The remainder is to be held as a "kitty" to meet emergency needs as determined by NPA.

Meanwhile, the Defense Production Administration has announced the following fourth quarter allotments of controlled materials which are of interest to the mining industry: Coal mining—steel, 25,615 tons; copper, 215,000 lbs; aluminum, 31,000 lbs; Coke ovens—steel, 18,135 tons; copper, 535,000 lbs; Metal and nonmetallic mineral mines, smelters and refineries —steel, 41,395 tons; copper, 1,435,000 lbs; aluminum, 140,000 lbs; Mining machinery and equipment—steel, 95,000 tons; copper, 2,595,000 lbs; aluminum, 225,000 lbs.

Roll Costs DOWN On Card Wheels!

Designed for efficient, economical operation. Longer life—based on metallurgy that puts *strength* where needed and *wear-resisting chill* on rim and flange.

We're glad to quote to your requirements.

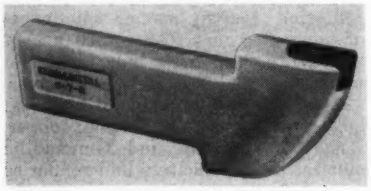
C.S. Card Iron Works Co.

Denver, Colorado

Manufacturers Forum

Bit for Hard Cutting

Tungsten-Carbide Mining Machine Bits that feature resistance to shock, are announced by Kennametal Inc., Latrobe, Pa. The new model is de-



signed, according to the manufacturer, to give longer periods of operation in cutting into roof and bottom rock, rolls, partings, binders, and to withstand the great impacts of hitting imbedded rock. The insert of the bit is narrower and sets deeper into the nose of the bit than the standard Kennametal design. The new bit is available in several shank sizes to fit most machines, and is adaptable for either continuous or regular service.

Rust-Killing Paint

PCA-100, a new penetrating and sealing anti-rust paint which can be applied right over rusted surfaces, is announced by the Paint Corp. of America, Cleveland. It is reputed to be equally effective in preventing rust on new metal or stopping rust action on present rusted metal. The manufacturer advises that PCA-100 can be applied over rust without extensive surface preparation such as wire brushing, scraping or sand blasting. The paint is available in one gal. and five gal. cans and in 55 gal. drums. For literature and further details, write Paint Corp. of America, Fidelity Building, Cleveland 14, Ohio.

Boost Iron Ore Production

A new high-speed mine hoist will help boost the production of defense-vital iron ore at the Alan Wood Steel Co.'s Scrub Oaks mine in Dover, N. J.

The hoist, driven by a 1750-hp General Electric dc motor, is designed to lift 250 tons of iron ore up a 3840-ft shaft every hour. Operating at a rope speed of 2315 fpm, the hoist will deliver a nine-ton load to the surface every two minutes.

Installation of the new hoist is part of a program to boost production of crude ore from the mine—New Jersey's largest—to about 2000 tons every eight working hours.

Constructed by the Nordberg Manufacturing Co., of Milwaukee, the new hoist will utilize two buckets or "skips," each having a nine-ton capacity.

In addition to the 1750-hp, amplidyne-controlled, adjustable voltage drive, General Electric will supply a 1500-kva, three-phase transformer, a motor-generator set, switchgear and controls.

Loosen Rusted Bolts

Operating on the principle that no moving object can be stopped instantaneously, the Torkon Impact Wrench loosens rusted nuts and bolts. A fly wheel spins in either direction and cretates an impact on the bolt or nut of up to 8000 lbs. The tool weighs only six lb and can be easily carried on the job. The manufacturer is Cooper Tool and Eng. Co., 3990 Alabama Ave., St. Louis Park, Minneapolis 16, Minn.

Bow Saw Introduced

For the first time Gensco Tool Division, General Steel Warehouse Co., offers a 30-in. saw with tapered frame for working in close quarters. One of the features of this saw is the blade

width of 1⅜ in. This extra width permits straighter cutting on wide timber.

Known as the "Miner," the saw was designed principally for cutting and fitting mine timbers. However, it will find wide application in many other cutting jobs where speed is important.

Details on the Bushman Bow Saw are available from Gensco Tool Division, General Steel Warehouse Co., Inc., 1830 North Kostner Avenue, Chicago 39, Ill.

Heavy Duty Boom

A new heavy-duty boom, designed especially for lifting and loading with their 5-ton truck-mounted Bantam shovel-crane, has just been announced by Schield Bantam Co., Waverly, Iowa.

Available in 25 ft length, with five ft extensions, the new Bantam boom has approximately four times the rigidity of standard booms. It is especially adaptable for logging operations,

pipe handling, steel erection, industrial materials handling, etc., thus increasing the work range of the truck-mounted Bantam, which is also available with shovel, trench hoe, back filler dragline, pile driver, magnet and clamshell attachments. The crane is said to be conservatively rated at 10,000 lbs capacity at 10 ft with outriggers and 1000 lb counterweight.

Small Geiger Counter

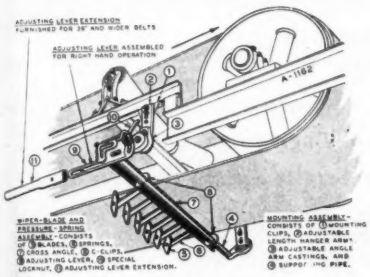
A low priced Geiger counter for use as a civilian defense instrument as well as for prospecting and school use has been placed on the market. The "Snooper" is so small it will fit in the palm of the hand or in a hip pocket, yet is more sensitive than many larger instruments. An ordinary flashlight battery is used for power. A miniature amplifier gives a loud audible signal whenever the "Snooper" comes near radio-activity, be it from uranium ore, cosmic rays, radium, x-rays or atomic explosion.

Specifications are: Size 1½ in. by

3 in. by 5 in. Weight 1¼ lb. For further information write Precision Radiation Instruments, 4113 W. Jefferson Blvd., Los Angeles 16.

Belt Cleaner Proves Effective

According to the manufacturer, the S-A Spring Type Conveyor Belt Cleaner has proven to be one of the most effective methods yet devised for cleaning conveyor belts. Self aligning, spring steel wiper blades, set perpendicular to the belt surface, but diagonal to belt travel, wipe the belt clean and dry as it passes. Spring arms supporting the blades maintain a uniform pressure on the belt and allow them to ride easily over obstructions such as belt splices. Dribble from the Cleaner falls directly into the rear of the discharge chute at the head end of the conveyor.


ADJUSTING LEVER EXTENSION
FURNISHED FOR 36" AND WIDER BELTS
ADJUSTING LEVER ASSEMBLED FOR RIGHT HAND OPERATION
A-1162
WIPER-BLADE AND PRESSURE-SPRING ASSEMBLY - CONSISTS OF ① BLADES, ② SPRINGS, ③ CROSS ANGLE, ④ C-CLIPS, ⑤ ADJUSTING LEVER, ⑥ SPECIAL LOCKNUT, ⑦ ADJUSTING LEVER EXTENSION.
MOUNTING ASSEMBLY - CONSISTS OF ① MOUNTING CLIPS, ② ADJUSTABLE LENGTH HANGER ARM, ③ ADJUSTABLE ANGLE ARM CASTINGS, AND ④ SUPPORTING PIPE.

Since the wiper has an independent mounting assembly, it can be easily adapted to fit existing conveyor installations. Adjustments and replacements can be made from either side without interrupting conveyor operation. For further information write for bulletin No. 651 from Stephens-Adamson Mfg. Co., Aurora, Ill.

Air Analyzer

A new instrument for use in analyzing air-pollution problems in highly industrialized areas has been developed by Battelle Institute, Columbus, Ohio. Because it will tell the direction from which large quantities of dirt come, it is expected to be useful to industries and municipalities in locating the sources of air-pollution nuisance.

Known as a "directional dirt-fall collector," the new instrument will provide an index of the general location of plants which may be responsible for heavy dirt fall. It will evaluate, for example, the amounts of dirt blown from across surrounding rivers as well as the amounts of dirt originating locally.

The dirt-fall collector, which will be made commercially available by Eberbach & Son Co., Ann Arbor, Mich., is designed to collect heavy dirt from any direction the wind is blowing. For a reliable indication of the sources of heavy contamination the instrument must be exposed for 30-day collection periods over many months in carefully chosen locations. The amounts of collected material, explains Dr. Hamnett P. Munger, in charge of air-pollution research at Battelle Institute, must be correlated with data obtained from the Weather Bureau. A so-called "wind-rose pattern" shows the number of hours the wind has blown from the eight points of the compass. Knowing this, it is then possible to determine the relative amounts of dirt which have fallen per hour into the instrument from the various directions.

Cheap Building Blocks

American Nayco Corp., Cleveland, announced the American debut of Ytong, a light, strong, easy-to-work and cheap building block. The company is looking for qualified American firms to manufacture this European developed product.

Great claims are made for the material. It is cheap. Raw material for Ytong are low quality oil shale, limestone and coal mine waste products. Strength is described as being 1000 psi in compression. It can be worked like wood, cut, sawed or plugged.

For complete information on American production rights, address inquiries to American Nayco Corp., NBC Bldg., Cleveland, Ohio.

—*Announcements*—

Quaker Rubber Corp., a division of **H. K. Porter Co., Inc.**, announced a $1,500,000 expansion of plant and manufacturing facilities. The expansion plan will increase the finished rubber products capacity of the plant by 30 percent.

Worthington Pump & Machinery Corp. has acquired **Wintroath Pumps, Inc.**, of Alhambra, Calif.

Robert J. Russell has been appointed sales manager of **Hardinge Co., Inc.**

The **Georator Corp.**, Arlington, Va., has announced the acquisition of the business and manufacturing facilities of the **Geophysical Instrument Co.** Manufacture of the same products as heretofore made will be continued in the Geophysical Instrucent Co. Division of the Corporation.

Appointment of **Lloyd F. Giegel** as branch manager of the Gary, Ind., sales office of the **Reliance Electric & Engineering Co.**, and the addition of **Daniel J. Donnelly** in a sales engineering capacity to the company's Philadelphia office is announced by E. E. Helm, sales vice president.

Giegel joined the Reliance organization in 1947 following graduation from the Illinois Institute of Technology, Chicago, and has since been attached to the company's Applied Engineering Department.

The **Independent Pneumatic Tool Co.**, a mining equipment firm of Aurora, Ill., has recently set up a new Spokane, Wash., branch of its organization, with **George D. Florsheim**, Spokane, in charge. Previously, the company serviced the Coeur d'Alene and Metaline mining districts of the Northwestern region from its offices in Salt Lake City.

Ray L. Hampton has been named vice-president in charge of sales by **Mosebach Electric and Supply Co.**, Pittsburgh, Pa., manufacturers of track and trolley products for the mining industry. He was formerly sales manager for the company.

Hampton is a graduate from the University of West Virginia, class of 1934, and is a member of the Sigma Pi Sigma honorary physics society.

CATALOGS AND BULLETINS

BEARING MAINTENANCE. *The Anti-Friction Bearing Distributors Association, 1900 Euclid Ave., Cleveland 15, Ohio.* A continuing study of bearing maintenance techniques and successful maintenance, installation, and removal procedures is being published in pamphlet form. This is the first attempt to publish in permanent form all available maintenance information on every type of bearing. A file folder type of binder is being sent to each bearing user who requests it, on company letterhead, in which succeeding issues can be compiled.

BULLDOZER OPERATION. *Caterpillar Tractor, Peoria 8, Ill.* This 32-page, four-color operator's handbook, printed in comic book style, is available for heavy equipment operators. It explains in very simple language and pictures how to use bulldozers, how to pioneer side hill cuts, push loading, rock and tree removal, soft fill work, and other earthmoving procedures.

DIESEL ENGINE. *Nordberg Mfg. Co., Milwaukee 7, Wis.* Construction and operation features of the Nordberg four-cycle, one-cylinder and recently introduced two-cylinder, vertical, mechanical injection, type 4FS Diesel engine are contained in a new two-color bulletin No. 183. Nordberg engines described in this bulletin are built with a 4½-in. bore and a 5¼-in. stroke and are available with electric or manual starting. With an operating speed range of 1200 to 1800 rpm, the one cylinder engine develops 10-15 hp and the two-cylinder unit 20-30 hp. Bulletin 183 is available upon request.

PIPE AND BOLT MACHINES. *Beaver Pipe Tools, Inc., 350 Dana Ave., Warren, Ohio.* An informative folder describing various Beaver pipe machines and their particular advantages.

PROTECTIVE EQUIPMENT FOR ATOMIC ENERGY FIELD. *Mine Safety Appliances Co., Thomas and Meade Sts., Pittsburgh 8, Pa.* This bulletin, No. G-10, describes equipment for determining air and surface contamination by radioactive or toxic agents as well as protective clothing and oxygen therapy equipment.

Index to Advertisers

	Page
American Brake Shoe Co. — American Manganese Steel Division	4
American Cyanamid Co.	46-47
American Steel & Wire Co.	Third Cover
Anaconda Copper Mining Co.	62
Baltimore & Ohio Railroad Co.	66
Bemis Bro. Bag Co.	80
Bucyrus-Erie Co.	49
Buda Co., The	14
Card Iron Works Co., Inc., C. S.	85
Centrifugal & Mechanical Industries, Inc.	77
Crane Co.	48
Cummins Engine Co., Inc.	21
Denver Equipment Co.	67
Du Pont de Nemours & Co., Inc., E. I.	26
Edison, Inc., Thomas A. — Storage Battery Division	75
Electric Storage Battery Co., The	16
Gardner-Denver Co.	28
General Electric Co.	24-25
Harnischfeger Corp.	15
Hewitt-Robins, Inc.	45
Hoffman Brothers Drilling Co.	88
Independent Pneumatic Tool Co.	17-18-19-20
Ingersoll-Rand Co.	13
Jeffrey Mfg. Co.	10-11
Joy Mfg. Co.	2-3
Le Roi Co.	9
Link-Belt Co.	54-76 & Second Cover
Longyear Co., E. J.	68
Marion Power Shovel Co.	22
Mine Safety Appliances Co.	Back Cover
Mott Core Drilling Co.	88
National Mine Service Co.	12
Paris Mfg. Co.	81
Pennsylvania Drilling Co.	88
Read, Davis	82
Reliance Electric & Engineering Co.	23
Rock Bit Sales & Service Co.	74
Roebling's Sons Co., John A.	8
Salem Tool Co., The	76
Sanford-Day Iron Works	1
Smit & Co., Inc. Anton	84
Standard Oil Co. (Indiana)	27
Stephens-Adamson Mfg. Co.	6
Timken Roller Bearing Co.	7
Universal Vibrating Screen Co.	88
Woomer & Associates, J. W.	75
Young, L. E.	82

Established 1902

HOFFMAN BROS. DRILLING CO.

CONTRACTORS

DIAMOND CORE DRILLING

PUNXSUTAWNEY, PA.

Our specialty—Testing bituminous coal lands
Satisfactory cores guaranteed

CORE DRILLING

ANYWHERE

"We look into the earth"

PENNSYLVANIA DRILLING COMPANY

PITTSBURGH 20, PA.

CORE DRILLING

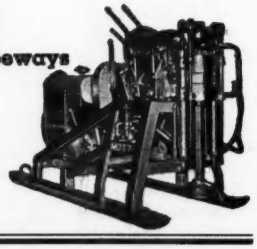
CONTRACTORS

Testing Coal Properties a Specialty
Guaranteeing Satisfactory Coal Cores

Pre-grouting mine shafts

Large diameter holes for
Drainage, Air-shafts and Escapeways

Inside Mine Drilling



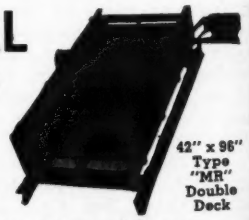
MOTT
CORE DRILLING CO.
Huntington, W. Va.

UNIVERSAL

VIBRATING SCREENS

FOR *CLEAN* AND

ECONOMICAL SIZING



42" x 96" Type "MR" Double Deck

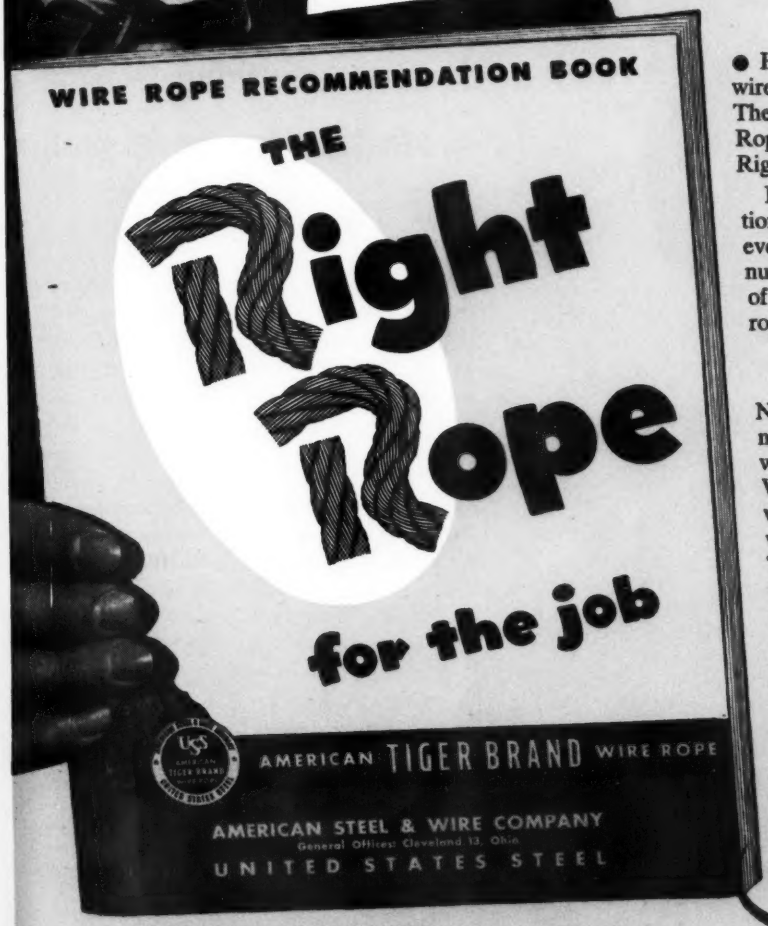
Write today for Catalog No. 109 on Screens and Screening.

UNIVERSAL VIBRATING SCREEN CO.

RACINE, WISCONSIN

This New Book can save plenty of money for YOU!

IT SHOWS YOU HOW TO BE A BETTER BUYER OF WIRE ROPE



● Here is a book that every user of wire rope should have in his file—The American Tiger Brand Wire Rope Recommendation Book, "The Right Rope for the Job."

It covers all industries—construction, mining, petroleum, marine—even aircraft control cable. There are numerous photographs, plus listings of equipment and the types of wire rope that should be used.

For Special Applications

Naturally, there will be applications not covered in the book. For these we maintain a staff of Tiger Brand Wire Rope Specialists — engineers who can help you select the wire rope which will fit your particular needs. These men are constantly working with users of Tiger Brand Rope . . . saving them money and eliminating trouble by properly specifying wire rope.

Don't pass up this opportunity

Send for FREE BOOKLET . . . Now.

AMERICAN STEEL & WIRE COMPANY, GENERAL OFFICES: CLEVELAND, OHIO
COLUMBIA STEEL COMPANY, SAN FRANCISCO
TENNESSEE COAL, IRON & RAILROAD COMPANY, BIRMINGHAM, SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

AMERICAN TIGER BRAND WIRE ROPE

USS

Excellay Preformed

American Steel & Wire Company
842 Rockefeller Building, Dept. N-9
Cleveland 13, Ohio

Please send me your Recommendation Booklet, "The Right Rope for the Job."

Name..... Position.....

Company.....

Address.....

City..... Zone..... State.....

UNITED STATES STEEL

When Minutes Count...

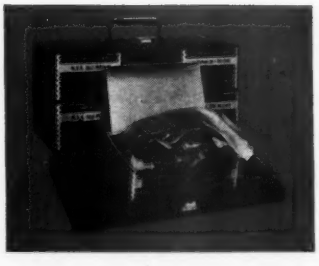
depend on the M.S.A. Self-Rescuer

Instant breathing protection for underground emergencies

When deadly after-damp is produced by fire or explosion, the miner's *immediate need* is breathing protection against carbon monoxide. The M.S.A. Self-Rescuer is an approved, dependable safety item that provides the precious minutes of emergency respiratory protection to the miner while traveling from a contaminated area into fresh air. Compact and light in weight, the Rescuer contains a chemical cartridge, hermetically sealed against deterioration. This cartridge is replaceable after use, a feature that makes the Rescuer an economical device for training purposes. The flexible rubber mouthpiece is shaped for a comfortable, natural fit in the mouth, and forms a perfect seal in combination with the newly designed nose clip to assure inhalation through the Rescuer only. U. S. Bureau of Mines Approved. Write for Bulletin No. BC-1.

For convenient underground storage

The M.S.A. Cache Assembly, consisting of 6 Self-Rescuers complete in a sturdy metal case, permits convenient underground storage throughout the mine. The Assemblies are designed for storage in various locations—working sections, along conveyor belt line, on man-trip cars—for instant application in emergencies. Individual carrying cases also available.



MSA

SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M.S.A. is at your service. Our job is to help you.

MINE SAFETY APPLIANCES COMPANY

Braddock, Thomas and Meade Sts. Pittsburgh 8, Pa.

At your Service: 48 Branch Offices in the United States

MINE SAFETY APPLIANCES CO. OF CANADA LIMITED

Toronto, Montreal, Calgary, Winnipeg, Vancouver, New Glasgow, N.S.

Representatives in Principal Cities in Mexico, Central and South America—
Cable Address: "Minsaf" Pittsburgh